

AD-752 894

UH-1H AIDAPS TEST BED PROGRAM. VOLUME II.

James Provenzano, et al

Hamilton Standard

Prepared for:

Army Aviation Systems Command

August 1972

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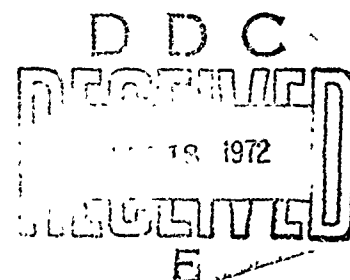
# USAAVSCOM TECHNICAL REPORT 72-18

## UH-1H AIDAPS TEST BED PROGRAM

### VOLUME II OF II

BY

JAMES PROVENZANO  
JOHN GAMES  
AL WYROSTEK  
ART OSTHEIMER  
JACK YOUNG



AUGUST 1972

U.S. ARMY AVIATION SYSTEMS COMMAND  
ST. LOUIS, MISSOURI 63166

CONTRACT DAAJ01-70-C-0827 (P3L)  
HAMILTON STANDARD DIVISION OF UNITED AIRCRAFT CORP.  
WINDSOR LOCKS, CONNECTICUT



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# FINAL TECHNICAL REPORT

— SUBMITTED TO —

## THE U.S. ARMY AVIATION SYSTEMS COMMAND

ST. LOUIS, MISSOURI

— IN ACCORDANCE WITH —

CONTRACT NO. DAA JO1-70-C-0827 (P3L)

## UH-1H AIDAPS TEST BED PROGRAM

Details of illustrations in  
this document may be better  
studied on microfiche

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SECTION I

INTRODUCTION

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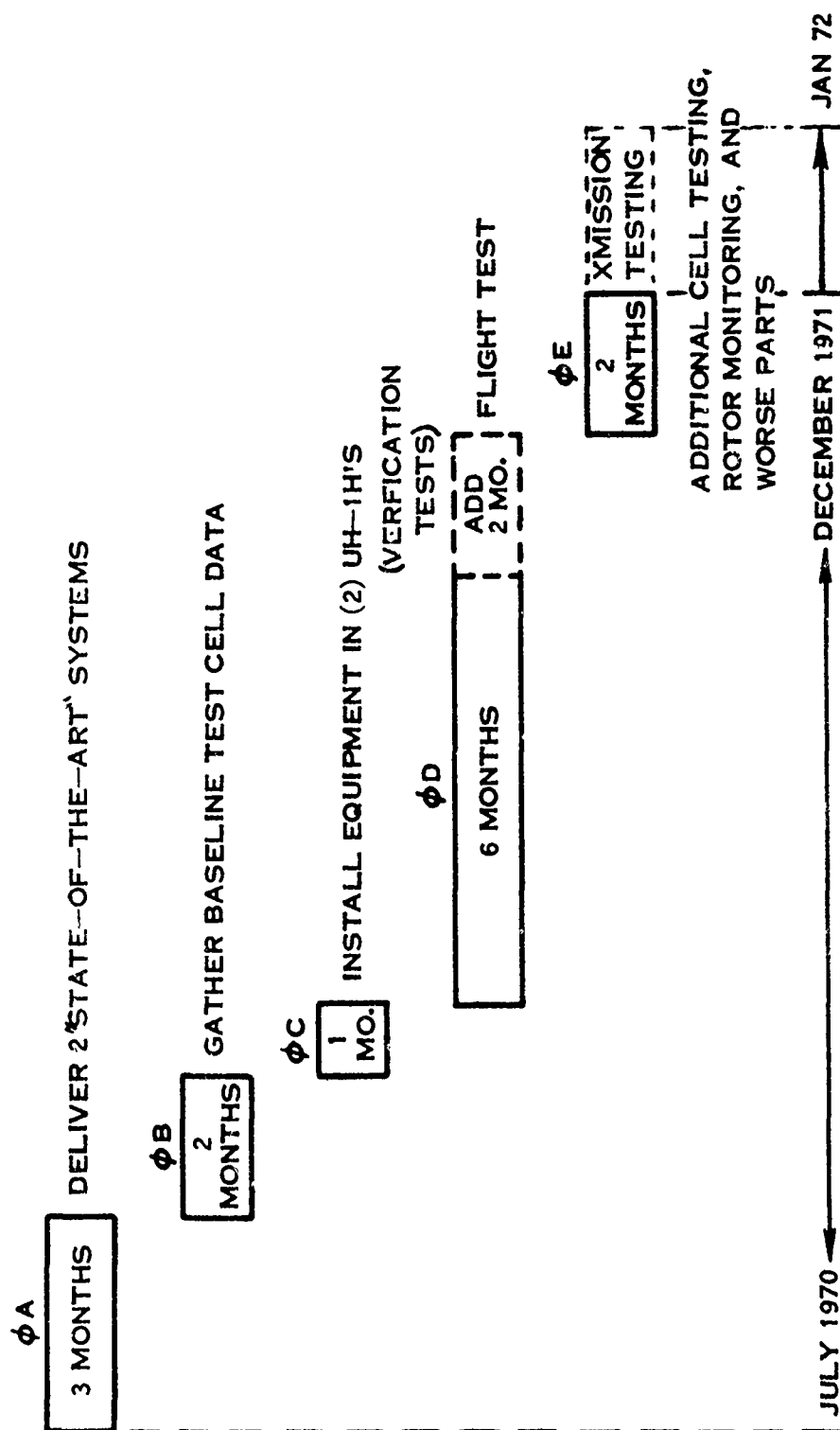
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## SECTION 2

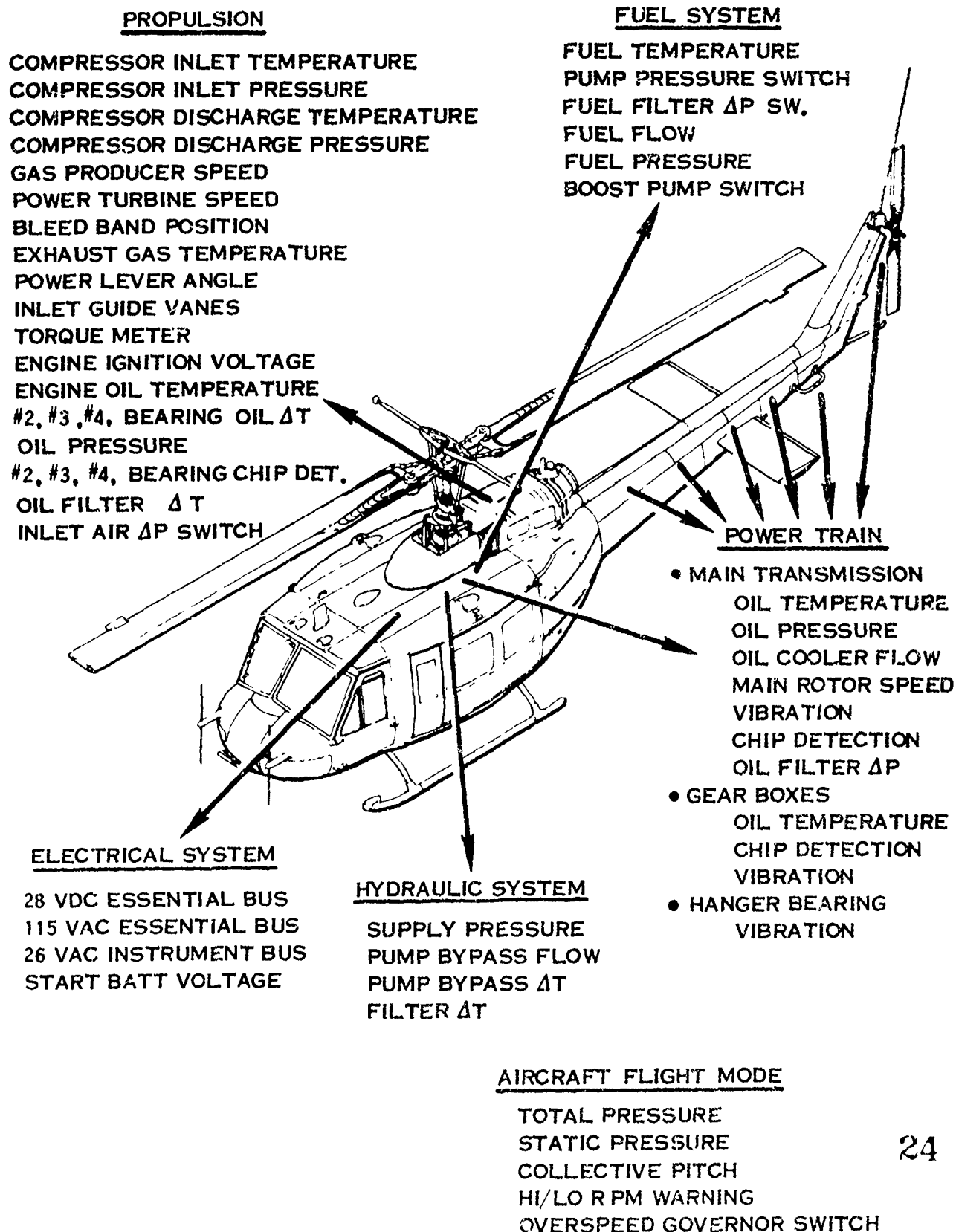
### PROGRAM CONDUCT AND ACHIEVEMENT HIGHLIGHTS

FIGURE 2-1

# UH-1 TEST BED PROGRAM



# TEST-BED PARAMETERS



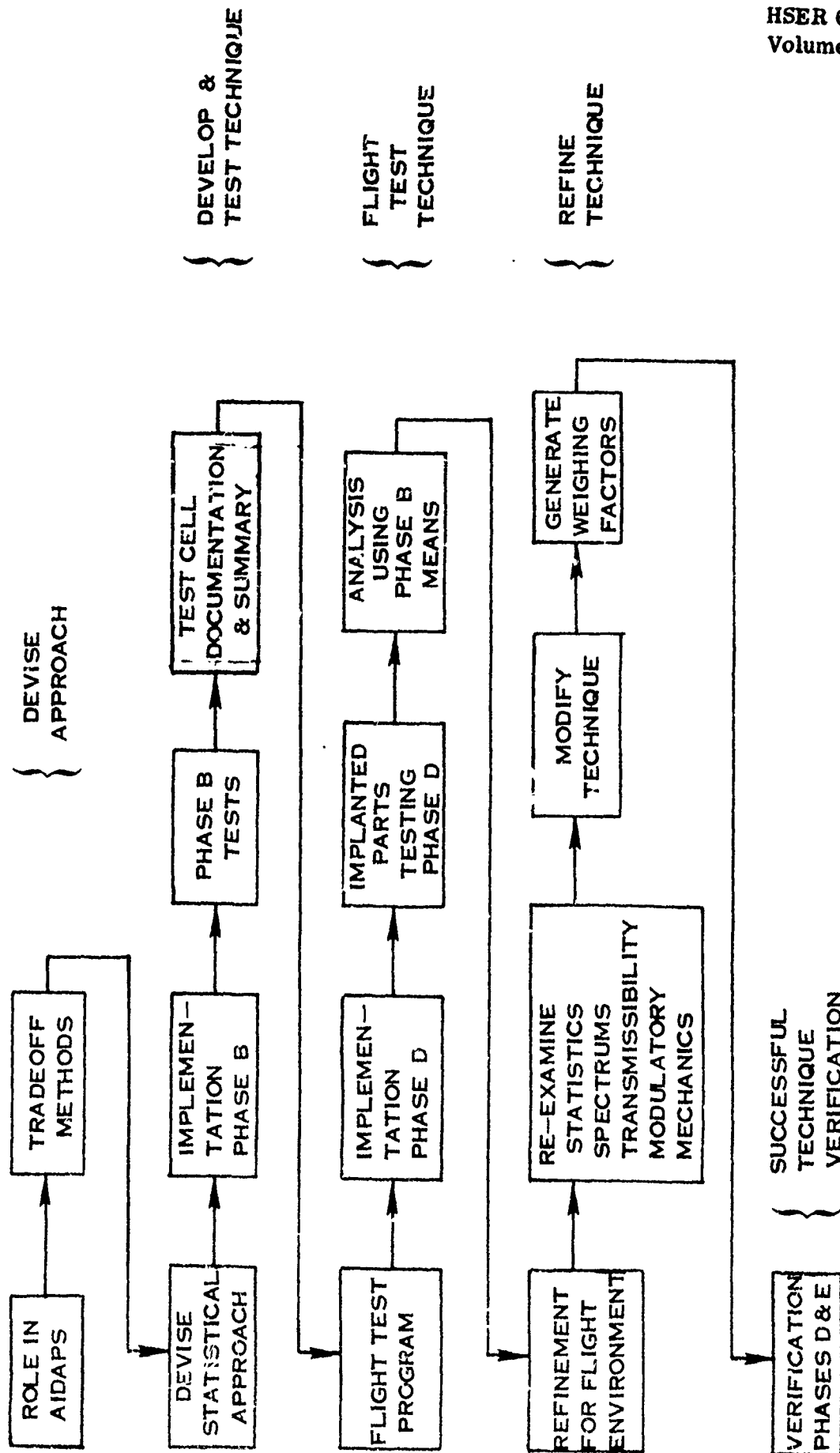


FIGURE 2-3. HAMILTON STANDARD VIBRATION TECHNIQUE DEVELOPMENT

SECTION 3

THE PROGRAM



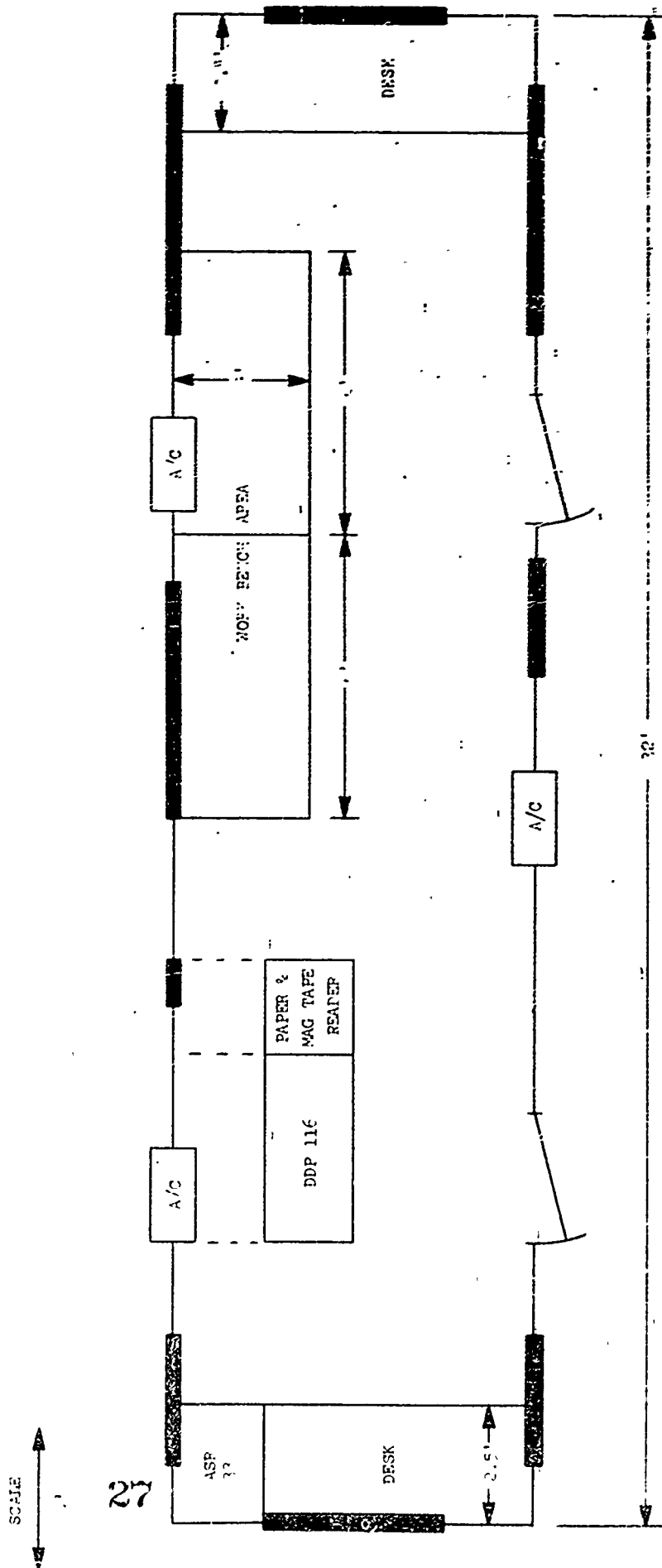
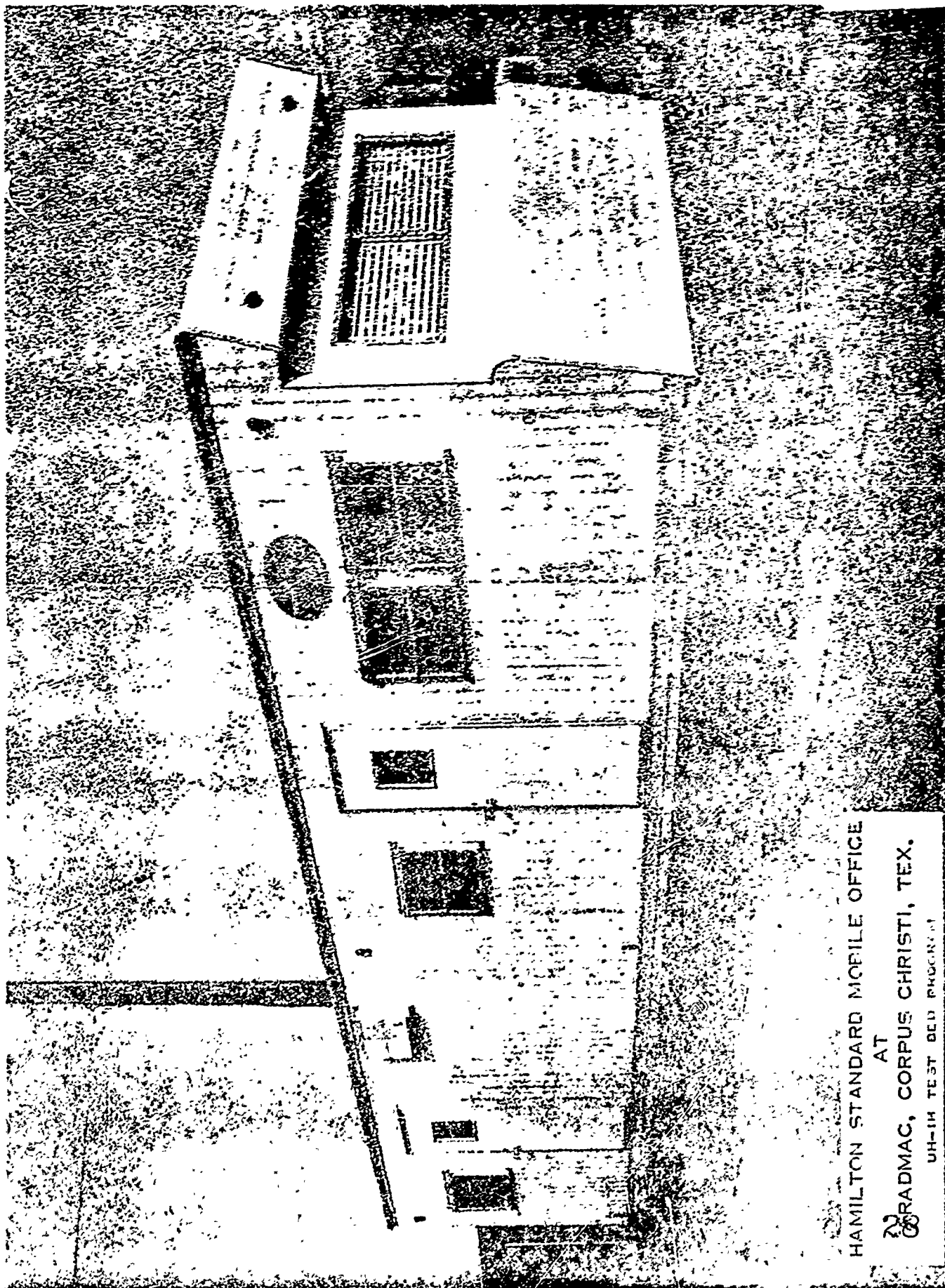


FIGURE 3-1 FLOOR PLAN-MC-36 MOBILE OFFICE (VAN)



HAMILTON STANDARD MOBILE OFFICE

AT

22 RADMAC, CORPUS CHRISTI, TEX.

UH-1H TEST BED PROGRAM

FIGURE 3-1 A



FIGURE 3-1 D

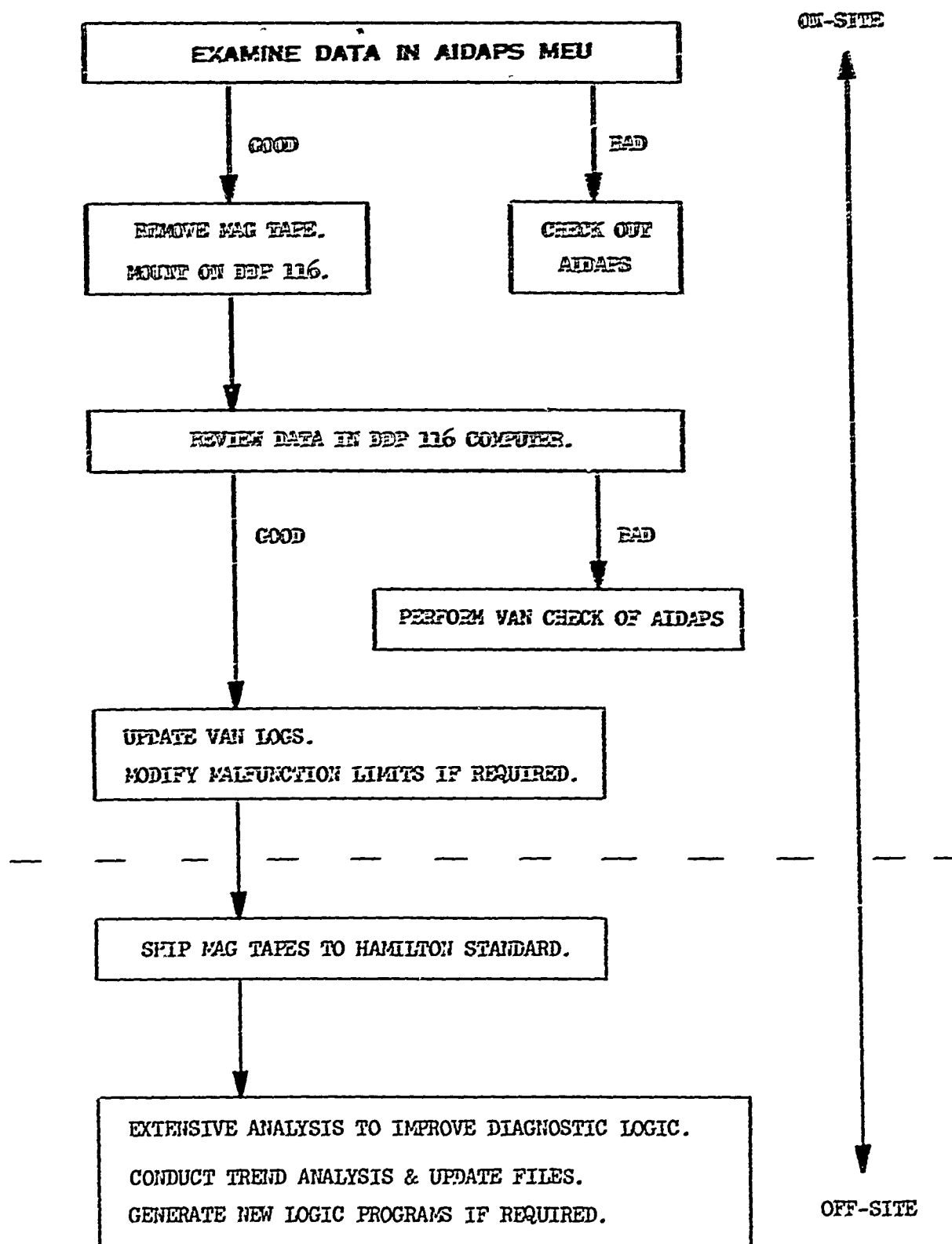


FIGURE 3-2 DATA ANALYSIS FLOW CHART

TABLE 3.1

REQUIRED OPERATION FOR DEGRADED ENGINE COMPONENTS

	#2 Bearing	#3/4 Bearing	N <sub>1</sub> Nozzle	N <sub>2</sub> Nozzle	N <sub>1</sub> & N <sub>2</sub> Nozzle	Rich Fuel Cont.	N <sub>1</sub> Rotor Balance	N <sub>2</sub> Rotor Balance	Worn Compressor
Degraded Comp.									
No. Required	2	2	2	1	1	1	1	1	1
Engine Condition									
Start Up	Yes		Yes	Yes	Yes	Yes			Yes
Idle									
Military	2 Min	2 Min	3 Min	3 Min	3 Min		2 Min	2 Min	3 Min
Autrotation			2 Min	2 Min	2 Min				
Accel/Decel			Yes	Yes	Yes	Yes			Yes
75% Power									
Normal Power	2 Min		2 Min	2 Min	2 Min		2 Min	2 Min	
90% Power									
Wave Off			Yes	Yes	Yes	Yes			
Shut Down									

TABLE 3-2

Tail Boom Sensor Drawings

<u>HS Item No.</u>	<u>Drawing No.</u>	<u>Title</u>
54, 56, 104 " " " " " "	Bell Dwg. 205-040-003 11x4856 11x4844	Driveshaft Inst. Tail Rotor, Long Boom Installation-Vibration Pickup-Shaft Hanger Bearings Bracket, Mounting-Vibration Pickup-Shaft Hanger Bearings
59 " "	Bell Dwg Pg 2 204-040-003 11x4848 11x 4837	Gear Box Assy, 42° Tail Rotor Drive Inst. Velocity Pickup & Accelerometer-42° Gear Box Bracket Mounting, Vibration Pickup-42° Gear Box
61 " "	Bell Dwg Pg 2 204-040-003 11x4848 11x4843	Gear Box Assy, 42° Tail Rotor Drive Inst. Velocity Pickup & Accelerometer-42° Gear Box Accelerometer Mounting Adapter-42° Gear Box
58	SK79730-110	42° Gear Box ΔT
90, 91	SK79730-150	Elec. Inst. All Existing Aircraft Sensors
64 & 66 " " " "	Bell Dwg. 204-040-012 11x4847 11x4836	Gear Box Assy, Tail Rotor Drive Inst, Velocity Pickups-90° Gear Box Bracket, Mounting, Vibration Pickup-90° Gear Box
63	SK79730-140	90° Gear Box ΔT

TABLE 3-3

Engine Sensor Drawings & Photographs

<u>HS Item No.</u>	<u>Photo/Drawing No.</u>	<u>Title</u>
1,9,17	Photo E6	----
2 "	Photo E4 PSK-15920	---- Manifold, Lubrication Pressure-Assy of (Rework)
3	Photo E15	----
5,6 " "	Photo E13 PSK16937	---- Isolation Tee Assy
10	Photo E4	----
11 "	Photo E15 1-160-645-01	---- Bracket, Chip Detector
12	Photo E10	----
13	Photo E1	----
14,4	Photo E14	----
18	Photo E5	----
19 " " " "	SK79730-180 SK79730-181 SK79730-182 SK79730-183 SK79730-184	Power Lever Angle Installation Bracket, Shaft Clamp Clamp, Synchro Shaft Bracket, Synchro Mtg. Platform, Synchro, Mtg.
15	Photo E3	----

TABLE 3-3  
(CONTINUED)

<u>Item No.</u>	<u>Photo/Drawing No.</u>	<u>Title</u>
16	Photo E2	----
20,122	SK79730-100	Flowmeter, Fuel Flow to Filter
" "	SK79730-101	Bushing, Reducer-Screw Thd to Flare Tube Connection
" "	SK79730-102	Tube Assy, Fuel Flowmeter
21,22,36	SK79730-150 Note 5	Electrical Inst. All Existing Aircraft Sensors
23,37,120,121	SK79730-150	Electrical Inst. All Existing Aircraft Sensors
8,30,32,24	Photo E11	----
26	Photo E9	----
29	Photo E8	----
31	Photo E7	----
34	SK79730-200	Bleed Band Switch
"	SK79730-201	Bracket, Bleed Band Switch
119	SK79730-190 SK79730-191 SK79730-192 SK79730-193 SK79730-194	Installation, Inlet Guide Vane Bracket, Synchro Mtg, IGV Plate, Synchro Mtg, IGV Shaft, Extender Bracket, Synchro Mtg, IGV
52	11x4857	Installation-Vibration Pickup-Shaft Hanger Bearing
"	11x4845	Adapter-Vibration Pickup-Shaft Hanger Bearing
7	Photo E12	----



TABLE 3-3  
(CONTINUED)

Miscellaneous Engine Photographs

Photo No.

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E17	-	Engine Harnessing
E18	-	Engine Harnessing
E19	-	Side View of Engine

TABLE 3-4

Transmission and Hydraulics Sensor Drawings

<u>HS Item No.</u>	<u>Drawing No.</u>	<u>Title</u>
38,39,40,43 102,69	SK79730-150	Electrical Inst, All Existing Aircraft Sensors
51	SK79730-20	XMSN. Ext. Oil Filter $\Delta$ P
"	SK79730-21	Elbow, Special, Neg Pressure Line
"	SK79730-22	Elbow, Special, Pos Pressure Line
"	SK79730-23	Bracket, $\Delta$ P Transducer Support
101	SK79730-60	XMSN. Oil Cooler Flow
"	SK79730-61	Upper Tube, XMSN Oil Cooler Flow
"	SK79730-62	Lower Tube, XMSN. Oil Cooler Flow
103	SK79730-70	XMSN. Internal Oil Filter $\Delta$ P
"	SK79730-71	Bracket, Int. Oil Filter
70	SK79730-90	Hydraulic Supply Pressure
71	SK79730-130	Thermocouple, All Fluid Temp
72	SK79730-30	Hydraulic Filter $\Delta$ P
"	SK79730-31	Bracket, Hydraulic Filter $\Delta$ P
107	SK79730-80	Hydraulic Pump Case Leakage
108	SK79730-130	Thermocouple, All Fluid Temp.
All XMSN Vib. Items	Cell Dwg. 205-040-001	Transmission Assy, Mechanical
" "	11x4855	Vibration Pickups
45 & 125	11x4850	Inst. Velocity Pickup & Acc.-Input Drive
" "	11x4839	Bracket, Mounting-Acc. & Velocity Pickup
		Transmission Input

TABLE 3-4  
(CONTINUED)

<u>HS Item No.</u>	<u>Drawing No.</u>	<u>Title</u>
47 & 123 " "	11x4849 11x4838	Inst. Velocity Pickups-Upper Mast Bearing Bracket, Mounting-Vibration Pickup, Main Mast Bearing
49 & 126 " "	11x4853 11x4841	Inst. Velocity Pickup & Accelerometer-Transmission Tail Rotor Drive Bracket, Mounting-Accel & Velocity Pickup Transmission-Tail Rotor Drive
129 "	11x4854 11x4842	Inst. Velocity Pickup-Transmission Bracket, Mounting, Velocity Pickup Transmission
127 "	11x4851 11x4840	Inst. Accelerometer, Transmission-Sun Gear Bracket, Mounting-Accelerometer Planetary Gears- Transmission
128 "	11x4852 11x4840	Inst. Accelerometer Transmission-Acc. Drive Gear Mesh Bracket, Mounting-Accelerometer Planetary Gears- Transmission

TABLE 3-5

Instrument Panel Sensor Drawings

<u>HS Item No.</u>	<u>Drawing No.</u>	<u>Title</u>
77	SK79730-40	Total Pressure (Airspeed)
78	SK79730-50	Static Pressure (Altitude)
"	SK79730-51	Assy, Tube, Static Pressure
87,41,112,113	SK79730-150	Electrical Inst, All Existing Aircraft Sensors
109,110,111	SK79730-150 Note 5	Electrical Inst, All Existing Aircraft Sensors
80	SK79730-120	Collective Pitch Synchro

TABLE 3-6

Electronic and Instrumentation Equipment Drawings

<u>Drawing No.</u>	<u>Title</u>
SK79850-1	Electronic Equipment, Installation UH-1
SK79850-2	Bracket, Support Rack
SK79850-3	Bracket, Mounting, Data Entry Panel
SK79850-4	Bracket, Mounting, Connector, Recorder
SK79850-5	Bracket, Mounting, Recorder
SK79850-6	Connector Mounting Plate MEU
SK79850-7	Equipment Mounting Deck, Main
SK79850-8	Equipment Mounting Deck, Left
SK79850-9	Equipment Mounting Deck, Right
SK79850-10	Equipment Weights and Location

TABLE 3.7

HSEB 6080  
Volume II

FLIGHT SEQUENCE //	LINE REPLACEABLE UNITS FLOWN
1	//2 BEARING (ENGINE) 42° GEARBOX INPUT (BALL)
2	#3 BEARING (ENGINE) 42° GEARBOX INPUT (ROLLER)
3	#4 BEARING (ENGINE) 90° GEARBOX INPUT (BALL)
4	#1 NOZZLE (ENGINE) 90° GEARBOX INPUT ROLLER
5	COMPRESSOR (ENGINE) 90° GEARBOX OUTPUT (BALL)
6	N <sub>2</sub> TURBINE (ENGINE) 90° GEARBOX OUTPUT (ROLLER)
7	MAIN MAST BEARING (TRANSMISSION)
8	TAIL ROTOR QUILL (ROLLER) (TRANSMISSION)
9	INPUT QUILL (TRANSMISSION)
10	#2 NOZZLE (ENGINE) 42° GEARBOX INPUT (BALL)
11	#4 BEARING (ENGINE) 42° GEARBOX INPUT (ROLLER)
12	SET #1 GOOD BASELINE LRU's (ENGINE, TRANSMISSION PARTS, 42° 90° GEARBOX)
13	SET #2 GOOD BASELINE LRU's
14	SET #3 GOOD BASELINE LRU's
15	SET #4 GOOD BASELINE LRU's
16	#2 BEARING (ENGINE) 90° GEARBOX INPUT (BALL)
17	#3 BEARING (ENGINE) 90° GEARBOX INPUT (ROLLER)
18	COMPRESSOR (ENGINE) 90° GEARBOX OUTPUT (BALL)

TABLE 3.7 CONTINUED

HSER 6080  
Volume II

FLIGHT SEQUENCE //	LINE REPLACEABLE UNITS FLOWN
19	FUEL CONTROL (ENGINE) 90° GEARBOX OUTPUT (ROLLER)
20	N <sub>2</sub> TURBINE (ENGINE)
21	#2 NOZZLE (ENGINE)
22	#1 NOZZLE (ENGINE)
23	FUEL CONTROL (ENGINE)
24	MAIN MAST BEARING (TRANSMISSION)
25	TAIL ROTOR QUILL (BALL) (TRANSMISSION)
26	TAIL ROTOR QUILL (ROLLER) (TRANSMISSION)
27	INPUT QUILL (TRANSMISSION)
28	TAIL ROTOR QUILL (BALL) (TRANSMISSION)

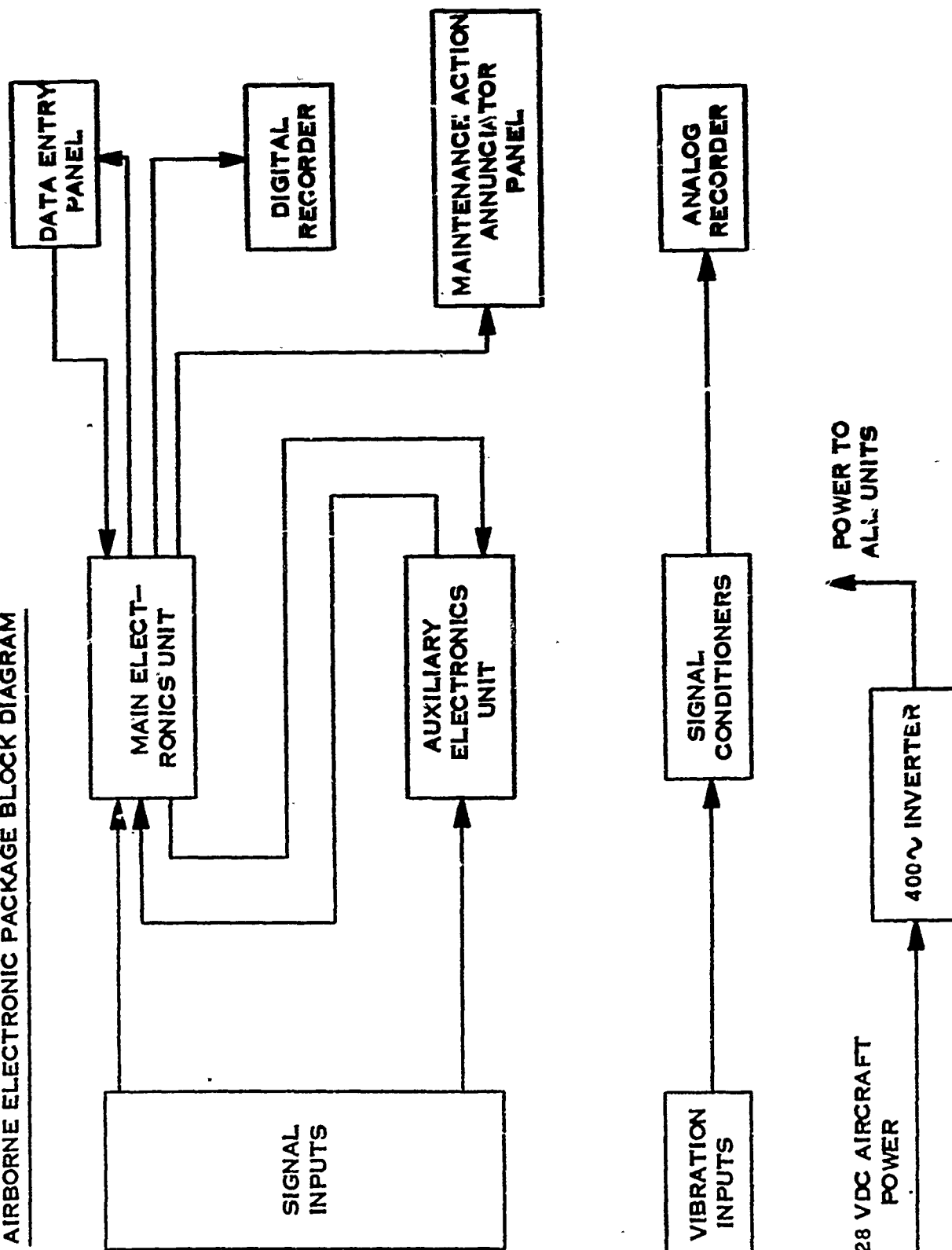
SECTION 4

ALBOWNE HARDWARE

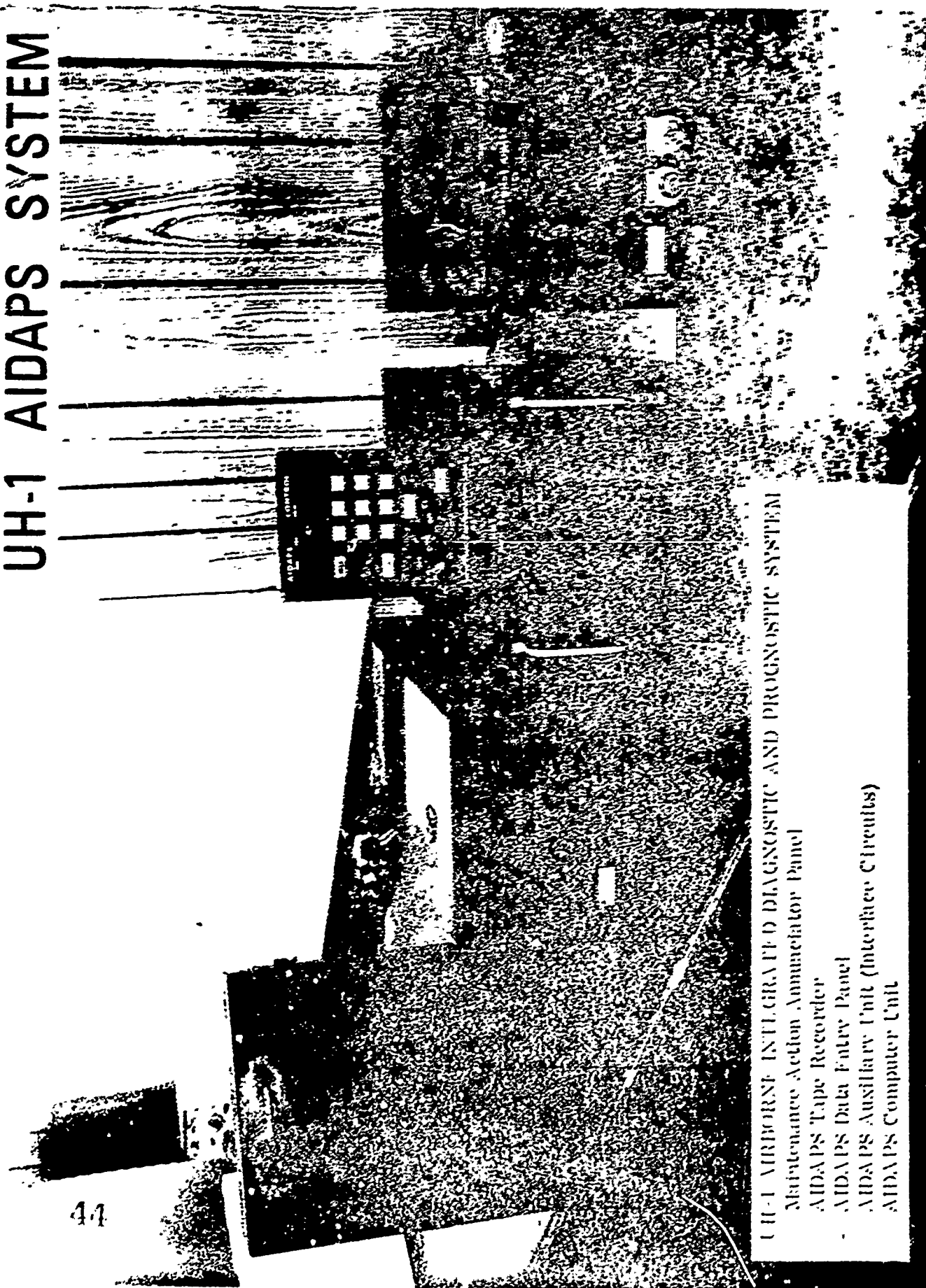


FIGURE 4-1

AIRBORNE ELECTRONIC PACKAGE BLOCK DIAGRAM



# UH-1 AIDAPS SYSTEM



UH-1 AIRBORNE INTEGRATED DIAGNOSTIC AND PROGNOSTIC SYSTEM  
Maintenance Action Annunciator Panel  
AIDAPS Tape Recorder  
AIDAPS Data Entry Panel  
AIDAPS Auxiliary Unit (Interface Circuits)  
AIDAPS Computer Unit

FIGURE 4-2

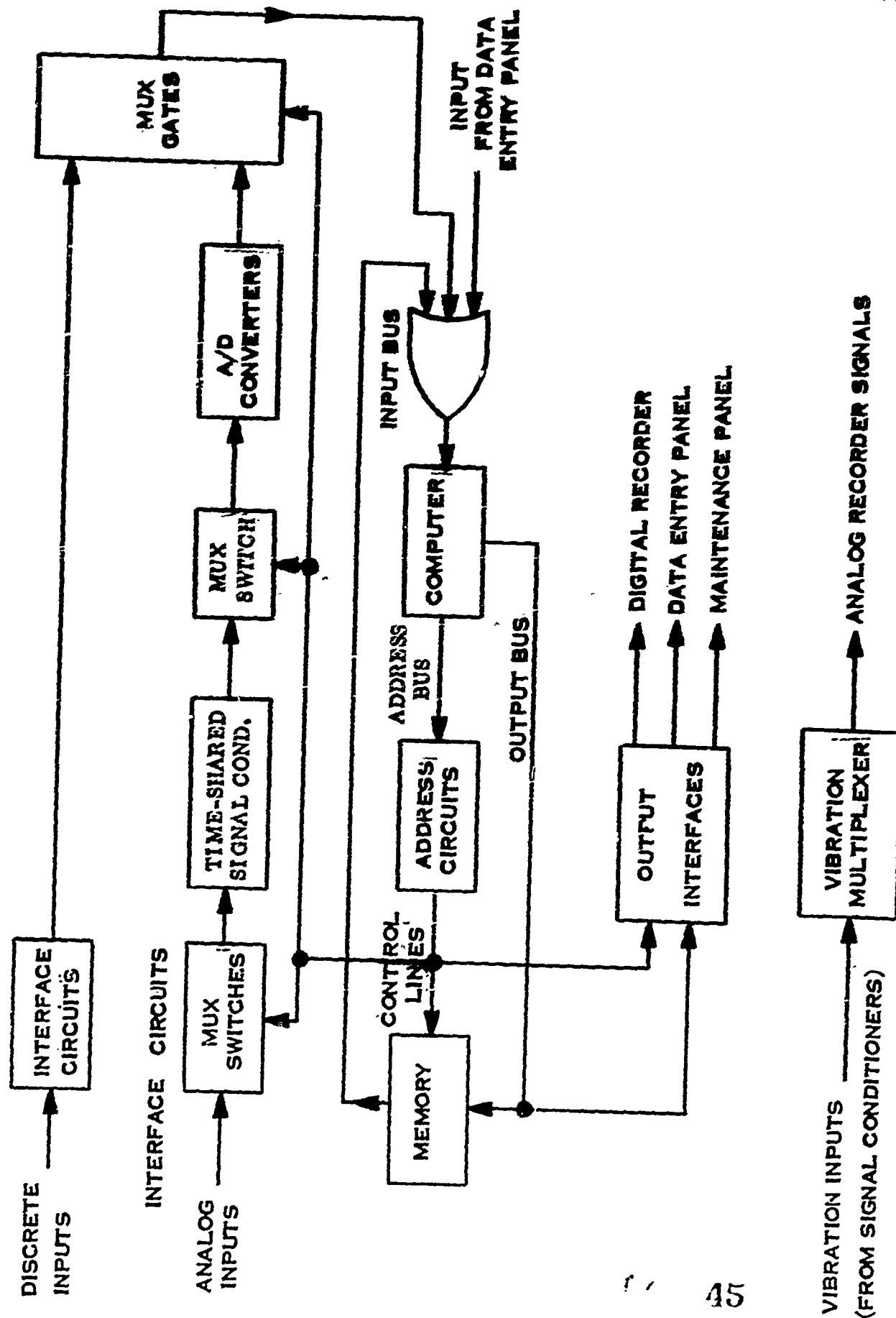


FIGURE 4-3 · ELECTRONICS BLOCK DIAGRAM

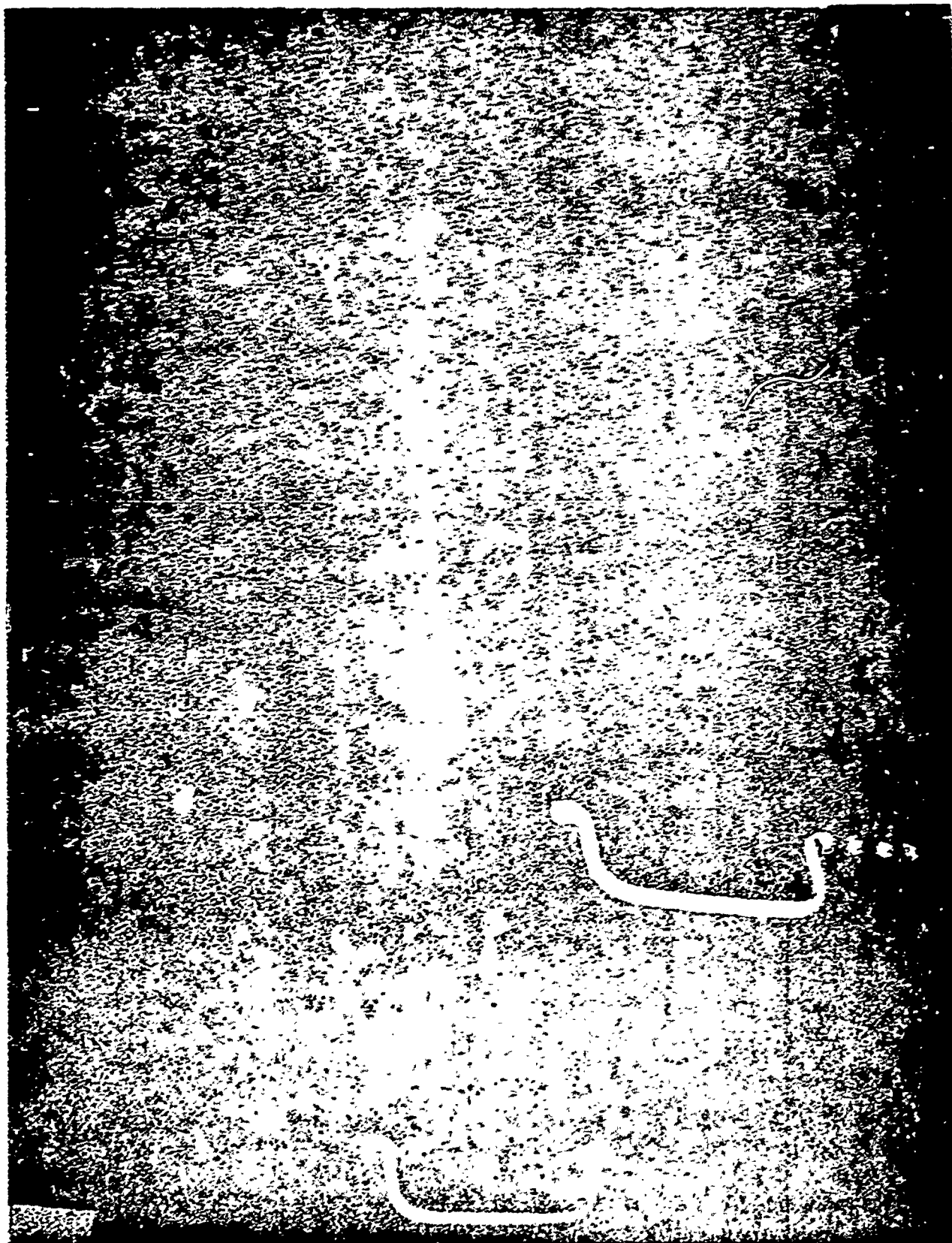
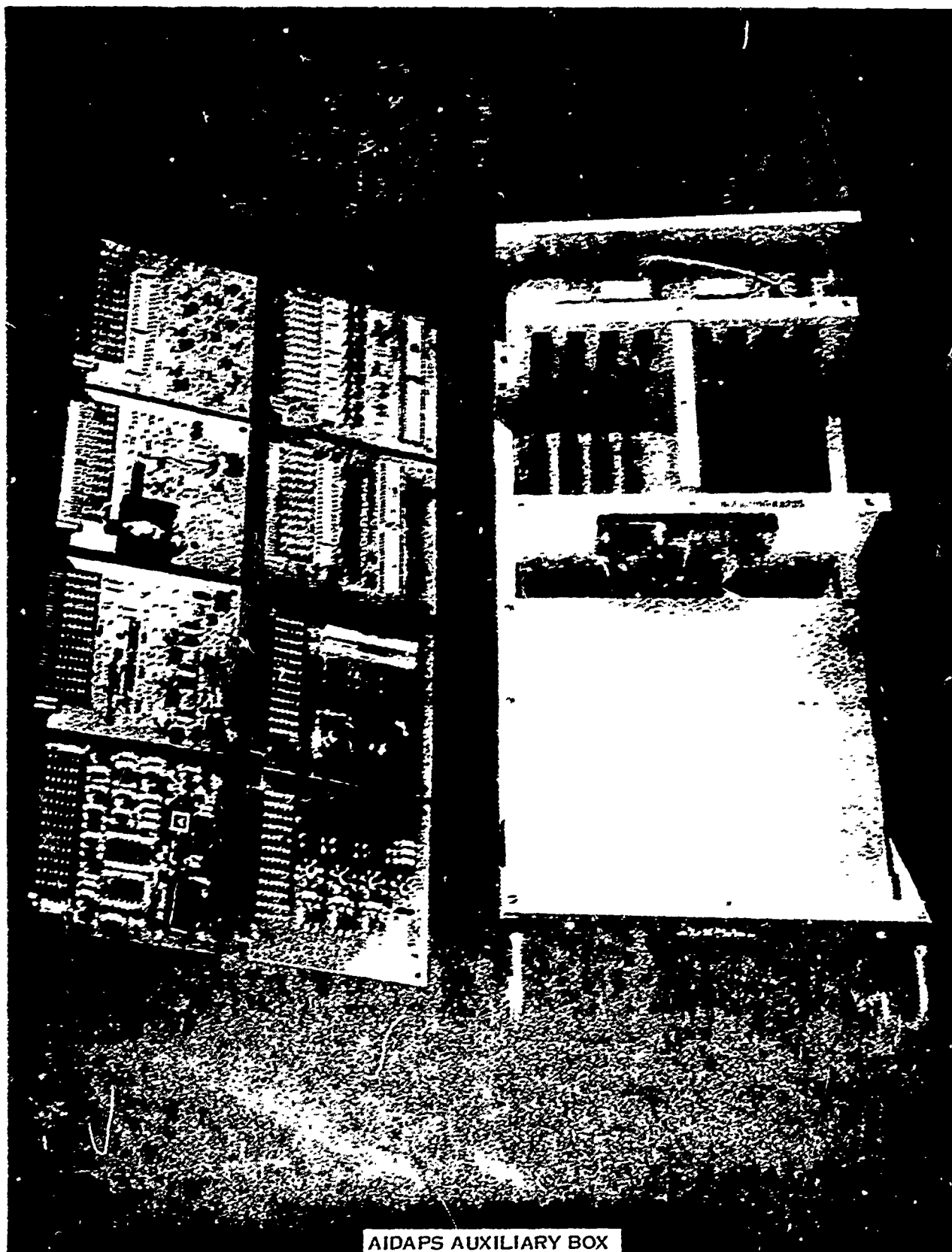


FIGURE 4-4

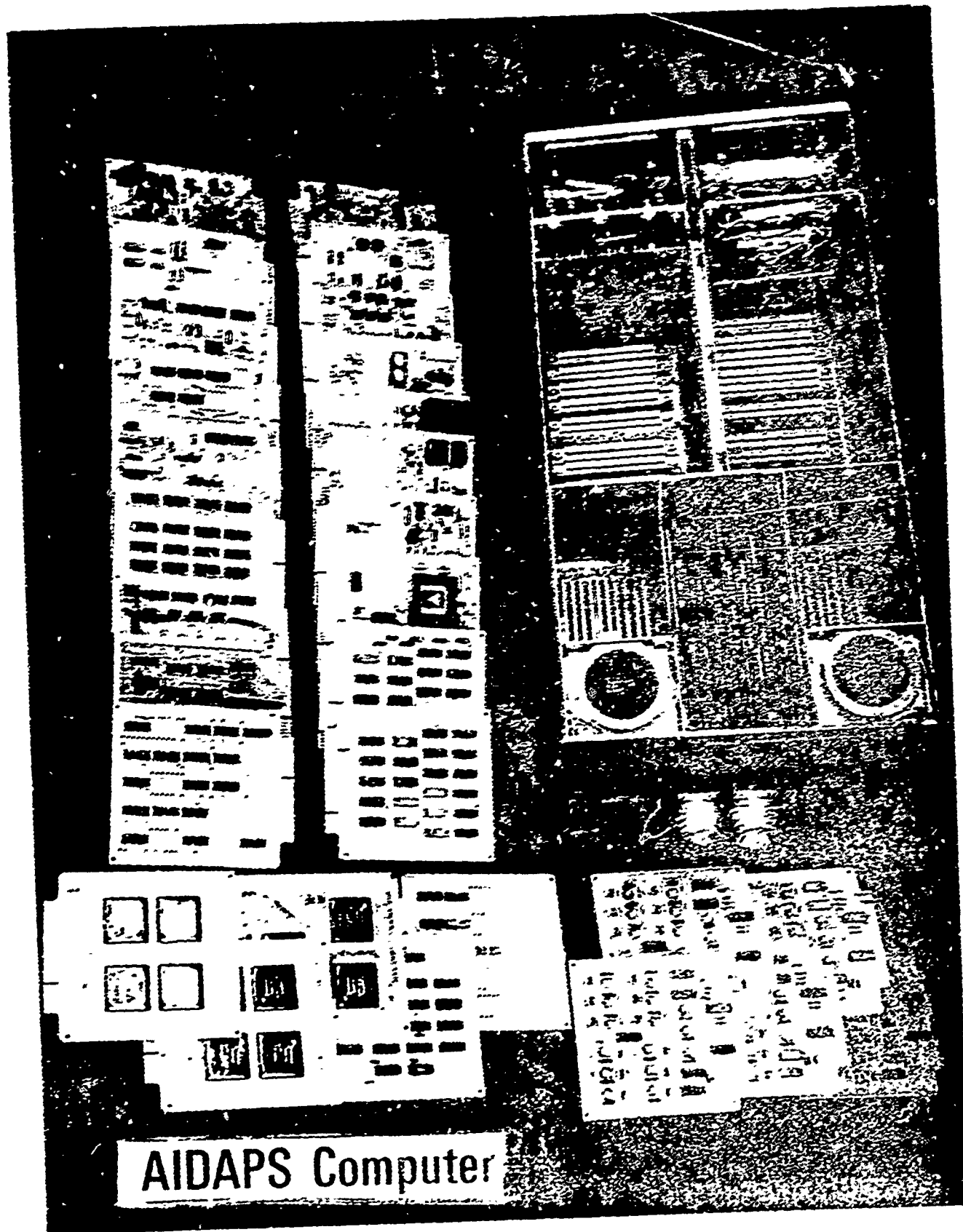




Reproduced from  
best available copy.



FIGURE 4-5



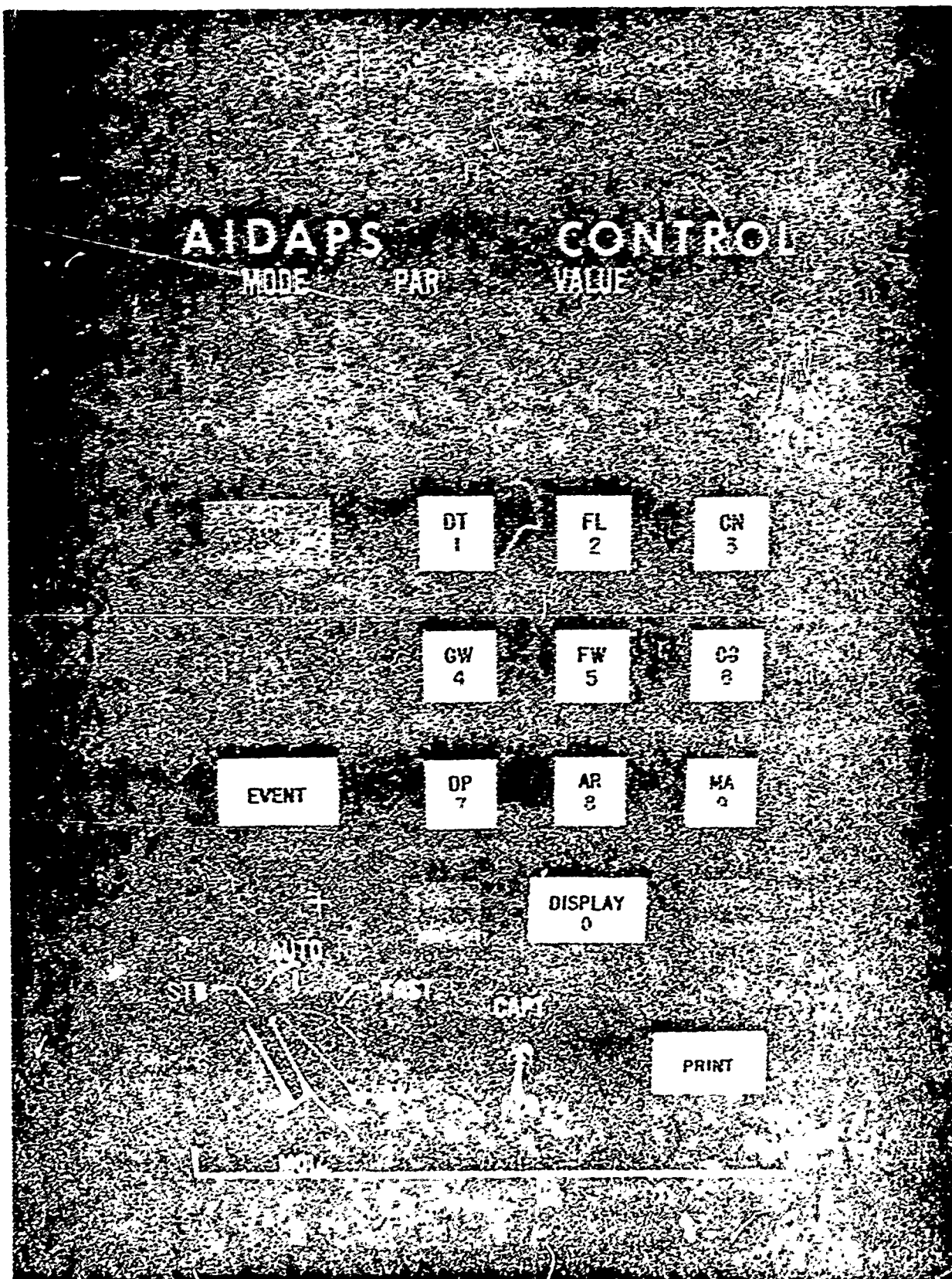


FIGURE 4-7



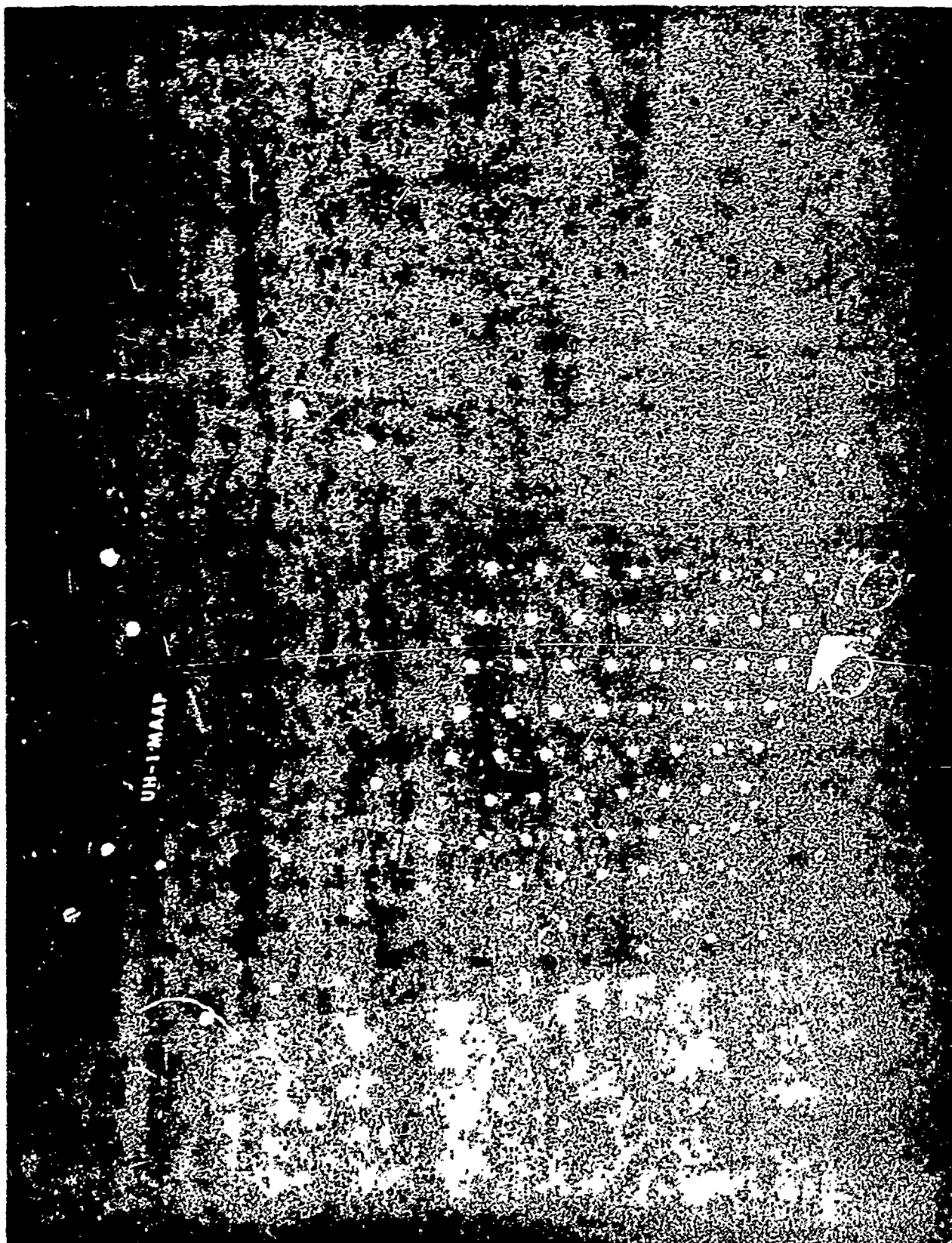


FIGURE 4-3





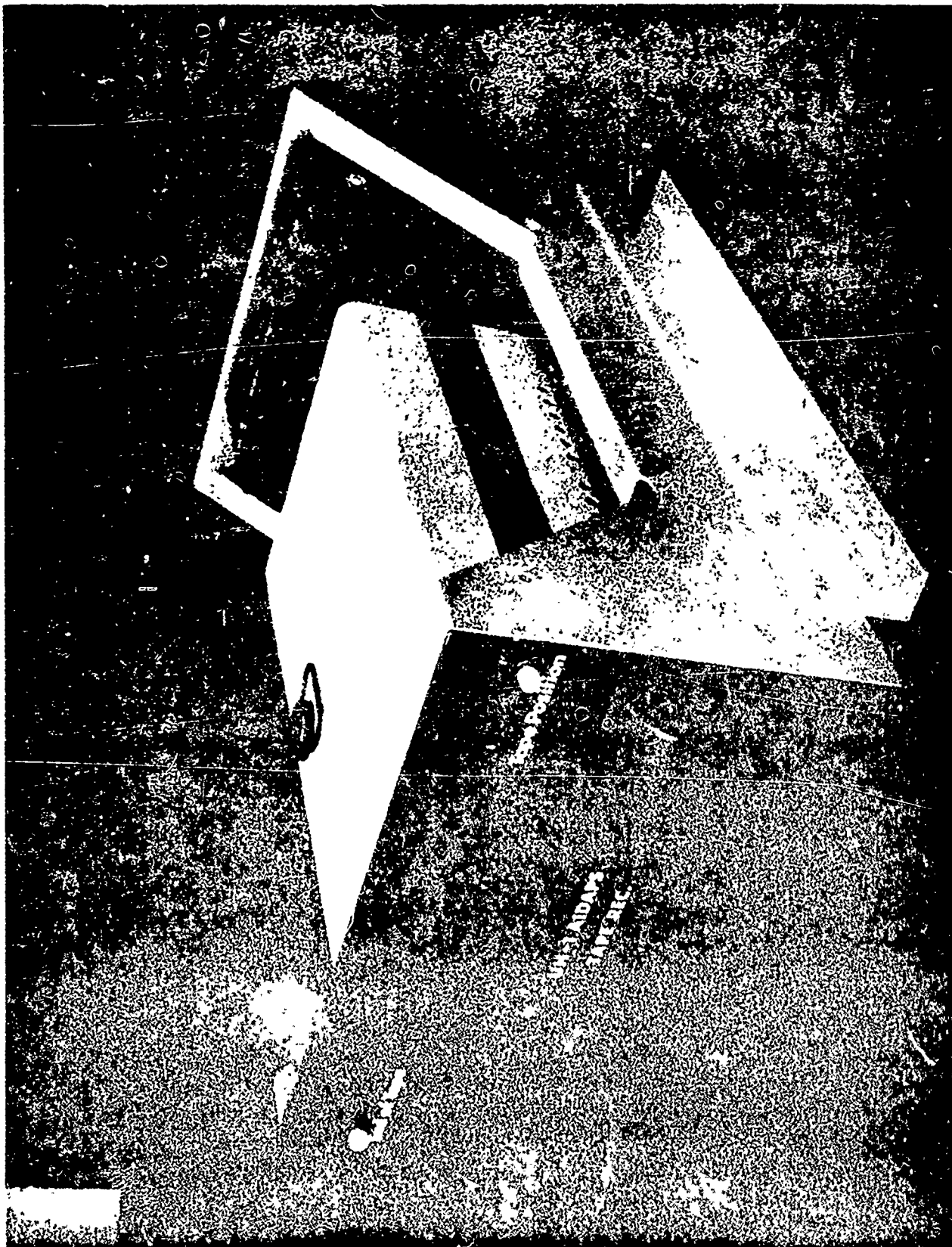
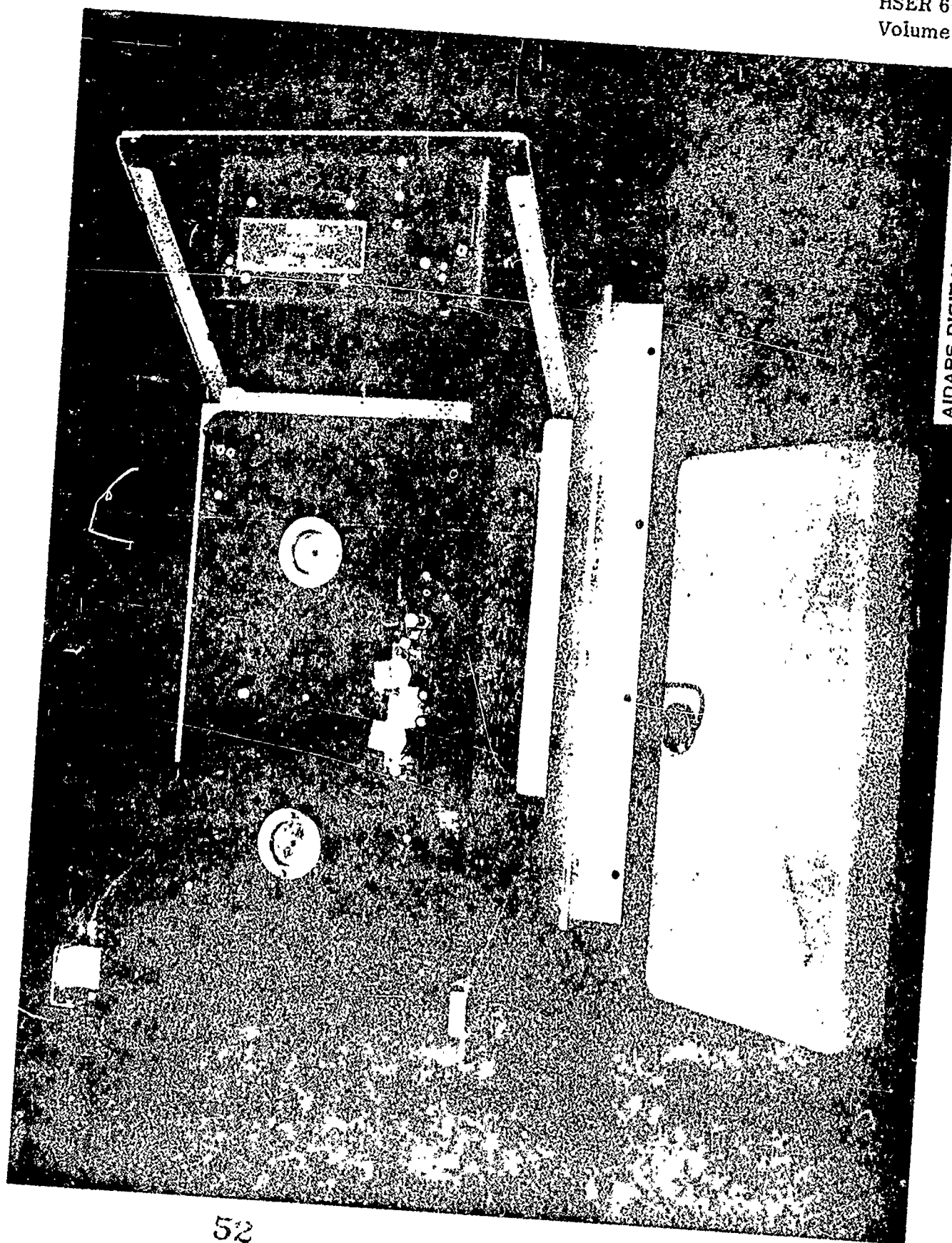
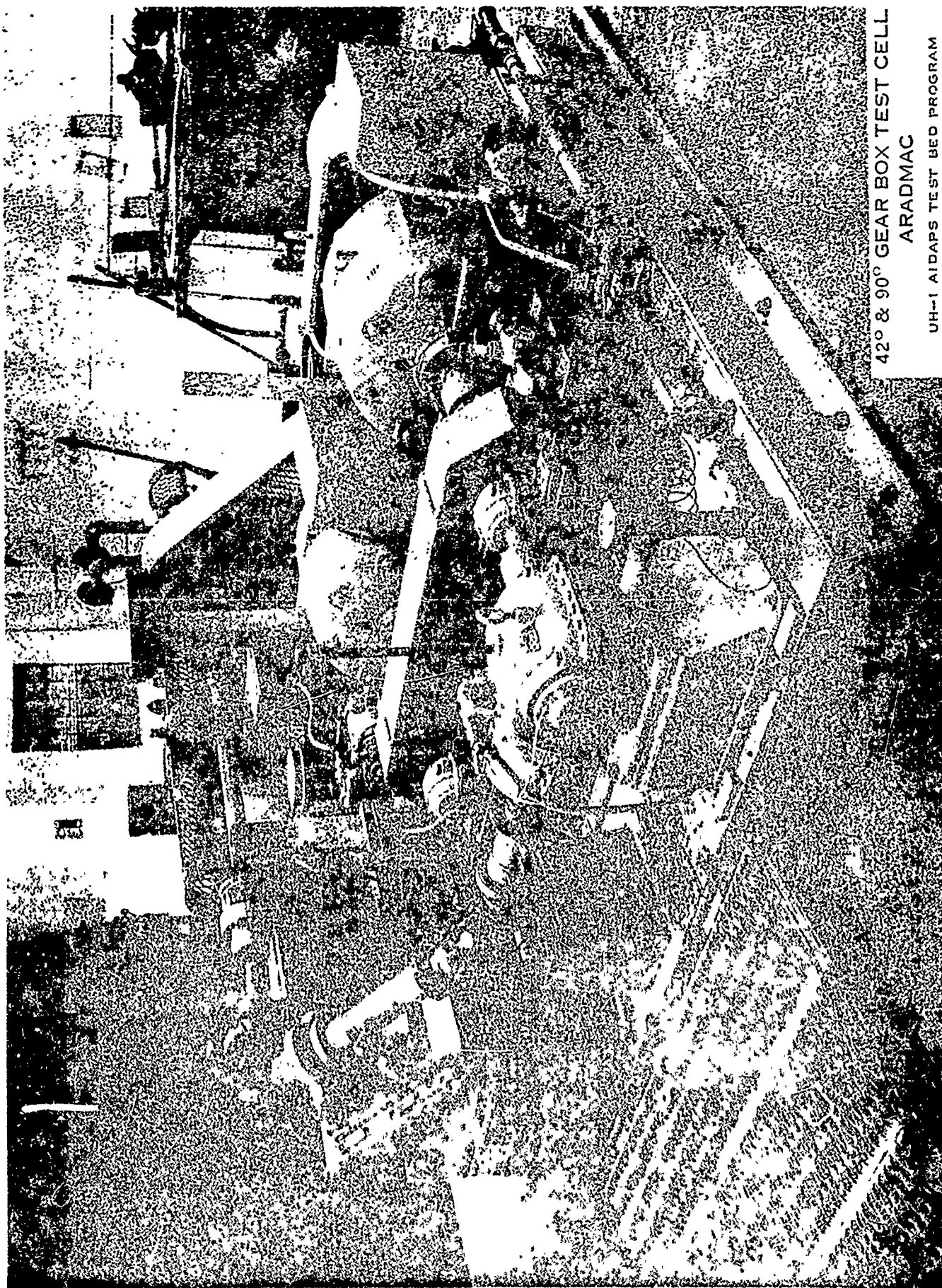


FIGURE 4-9

AIDAPS DIGITAL TAPE RECORDER

FIGURE 4-10





42° & 90° GEAR BOX TEST CELL  
ARADMAC

UH-1 AIDAPS TEST BED PROGRAM

FIGURE 4-11

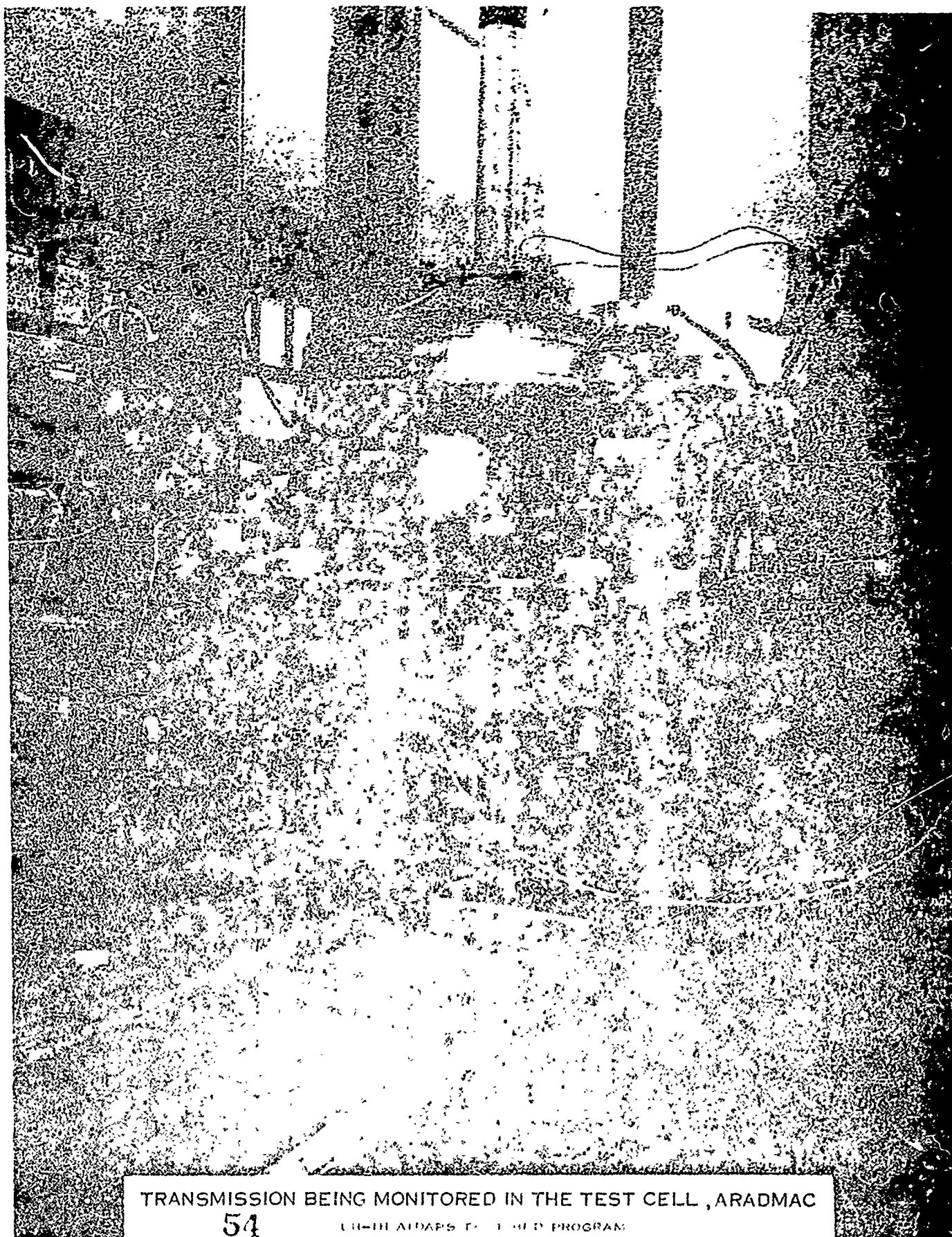
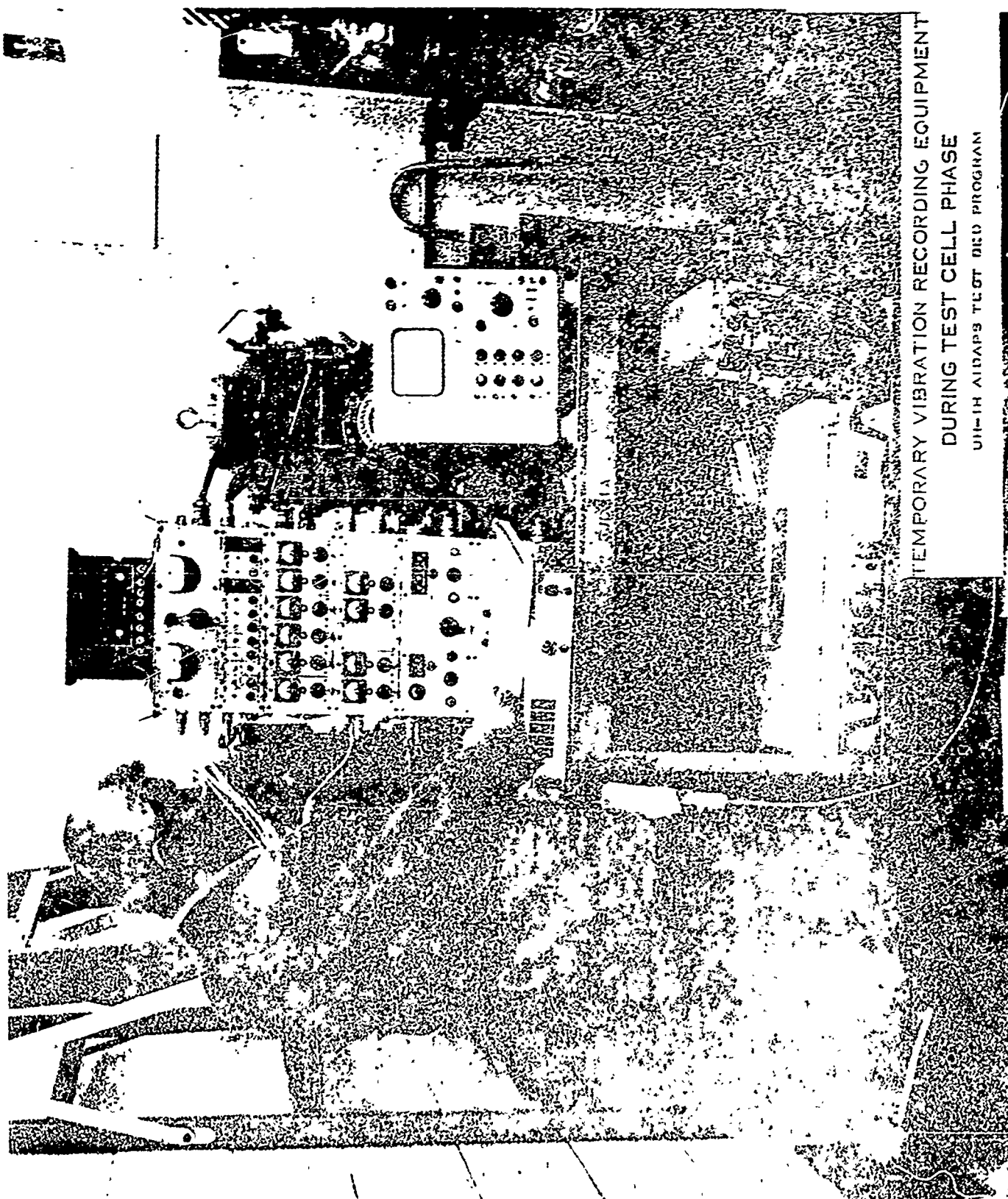


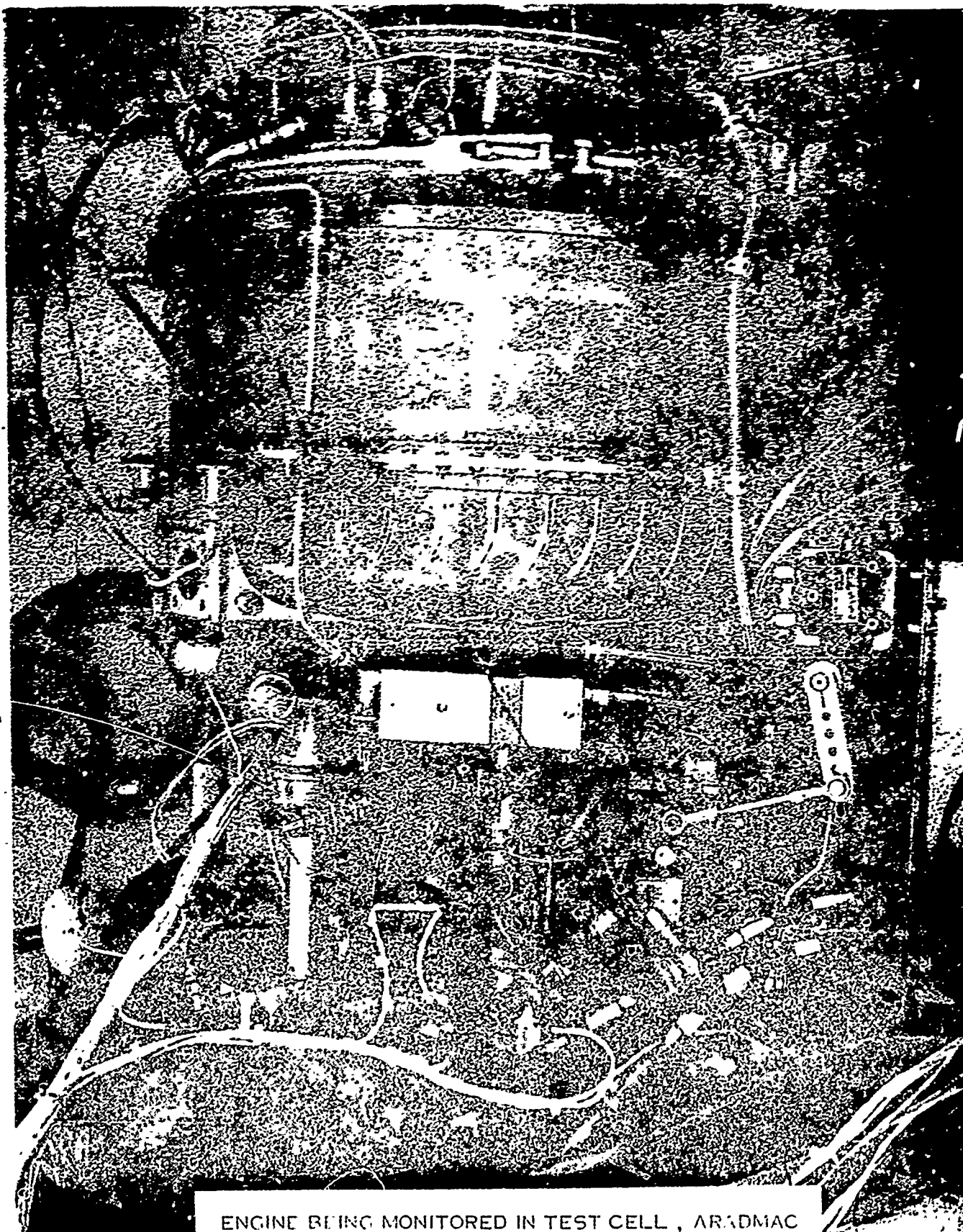
FIGURE 4-12





TEMPORARY VIBRATION RECORDING EQUIPMENT  
DURING TEST CELL PHASE  
UH-1H AIDAPS TEST BED PROGRAM

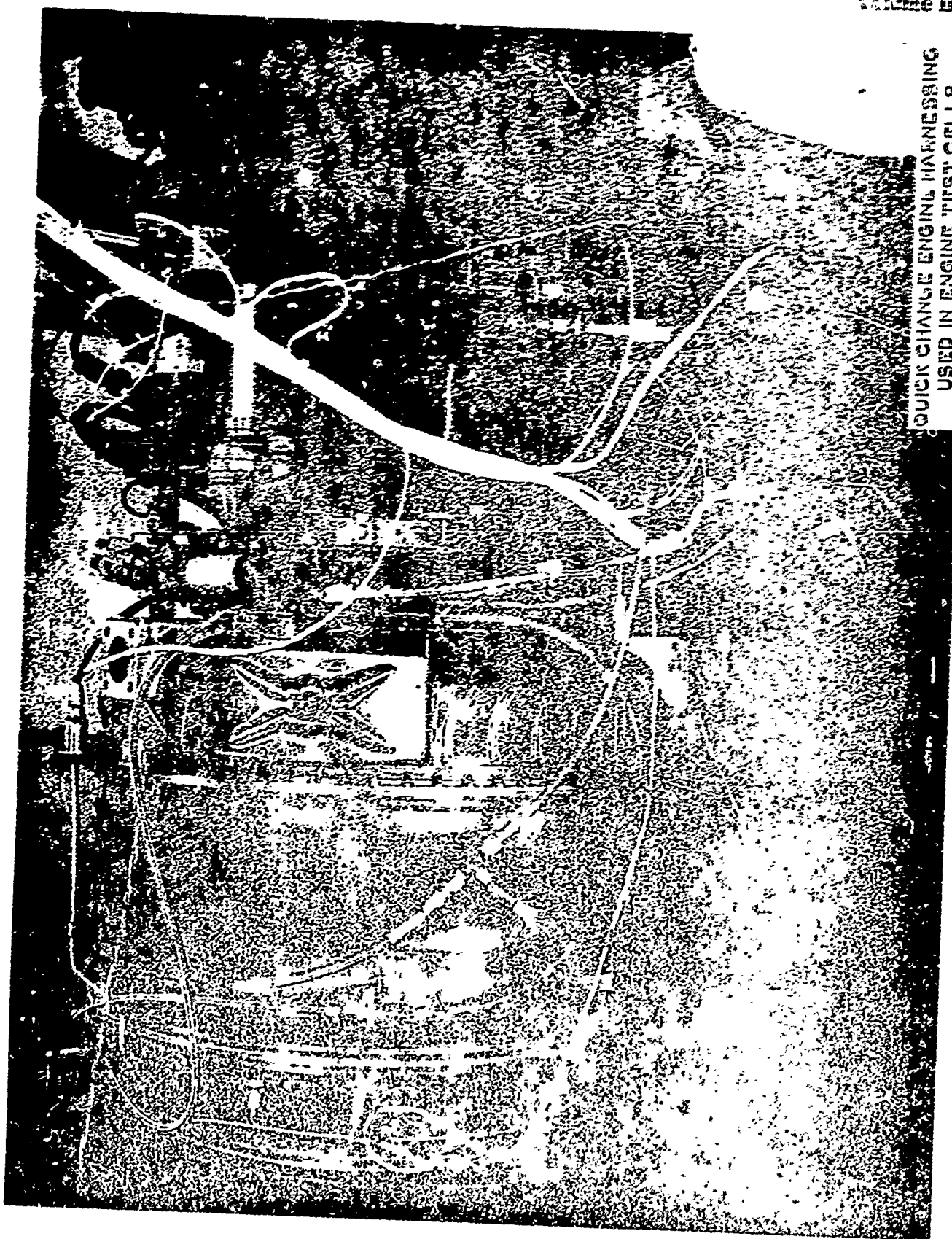
FIGURE 4-1.



ENGINE BEING MONITORED IN TEST CELL , ARADMAC

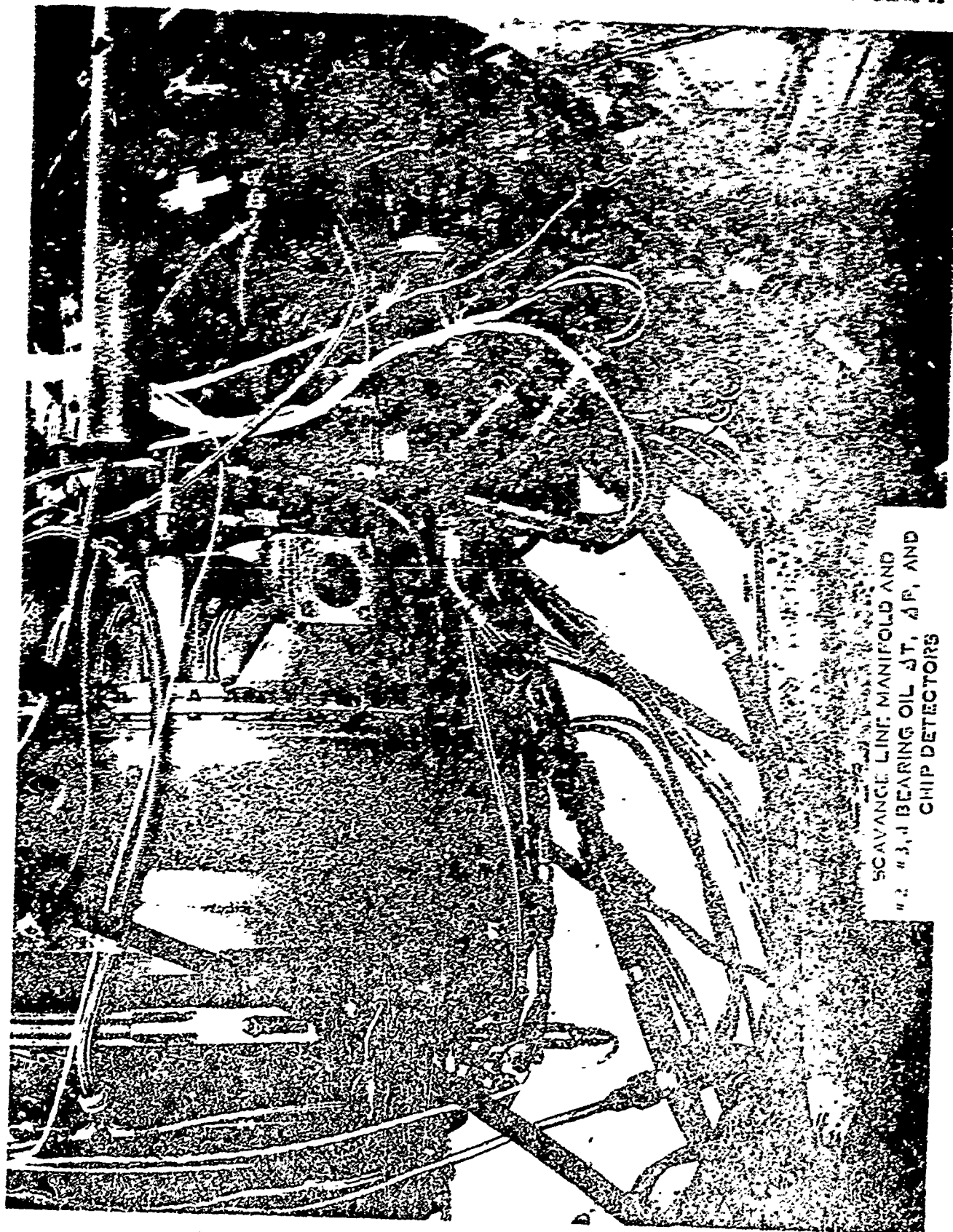
56

FIGURE 4-14



QUICK CHANGE ENGINE HARNESSING  
USED IN ENGINE TEST CELLS

FIGURE 4-15

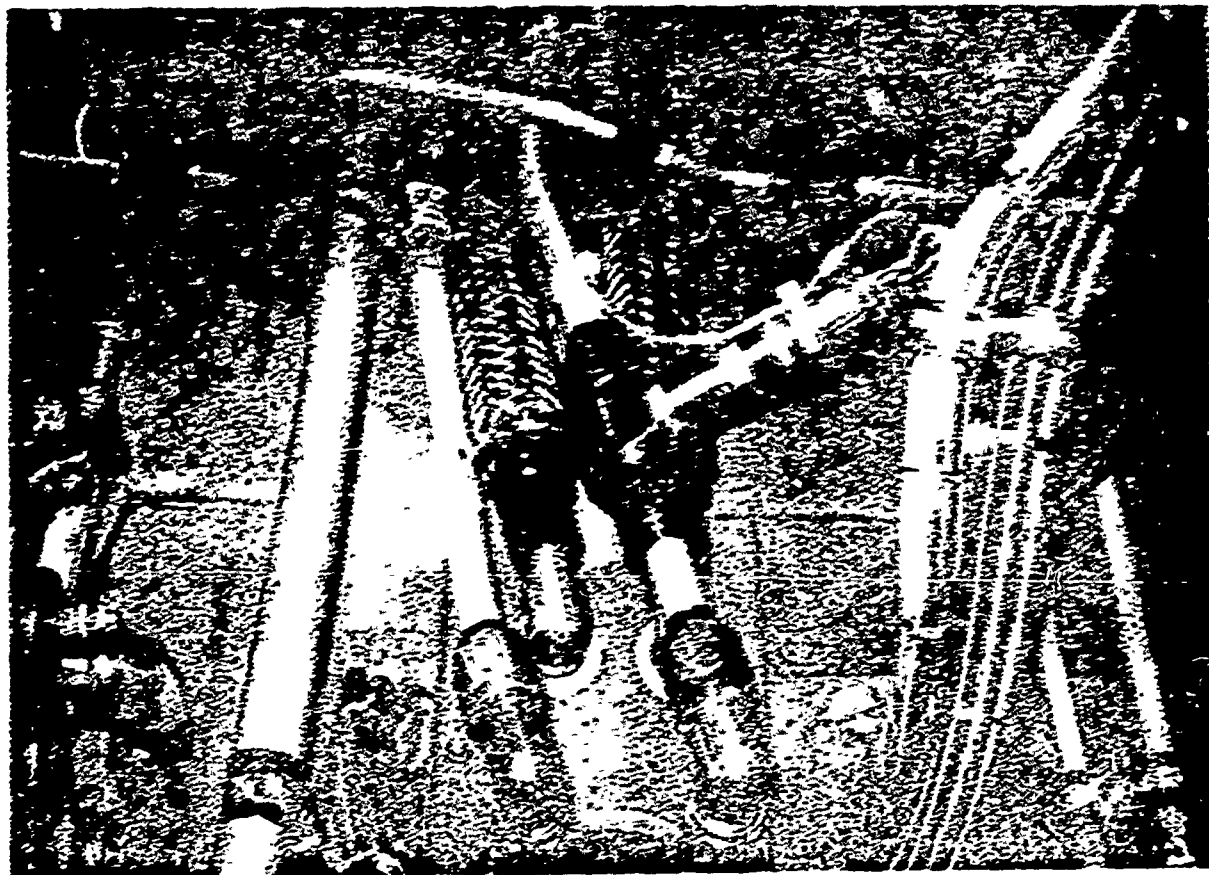


U.S. NAVY  
NAVY

SCAVANGE LINE MANIFOLD AND  
"2" "3" BEARING OIL AT, AP, AND  
CHIP DETECTORS

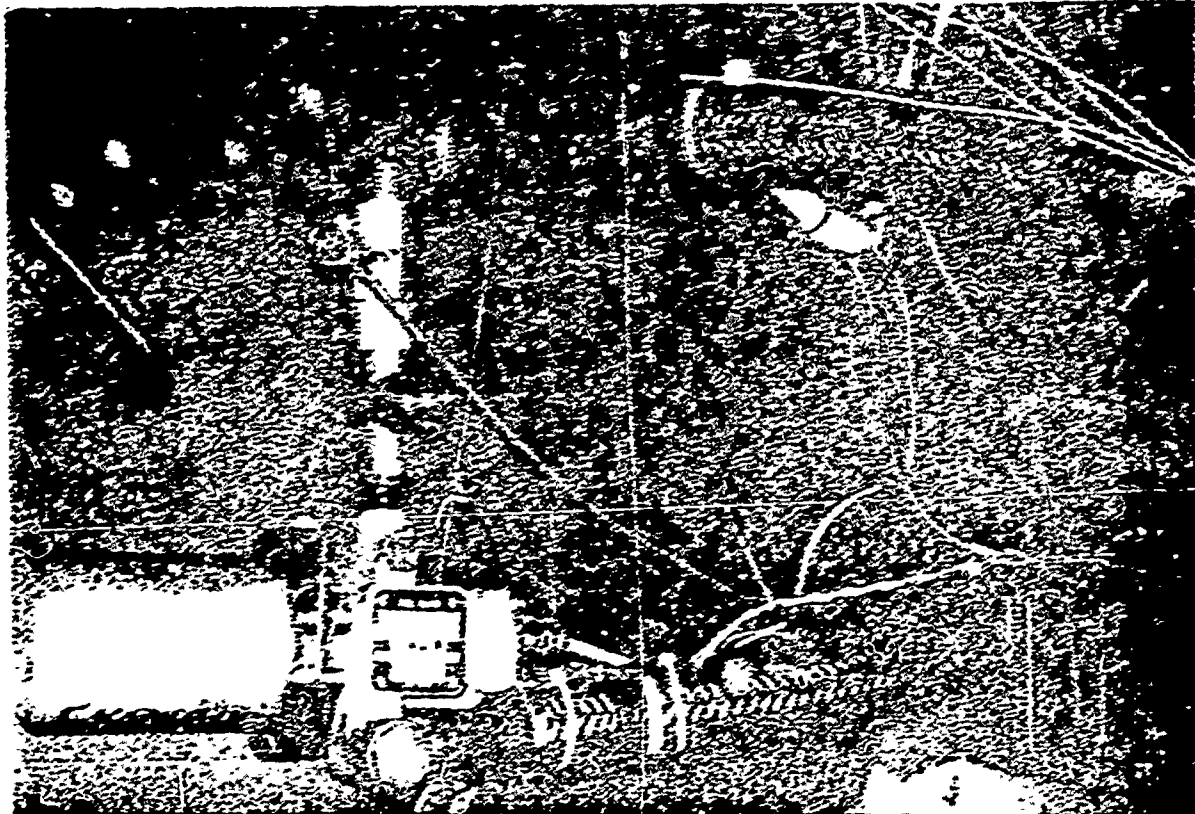
FIGURE 4-16





TRANSMISSION OIL COOLER FLOWMETER INSTALLATION  
ON THE UH-1H AIRCRAFT  
UH-1H AIDAPS TEST BED PROGRAM

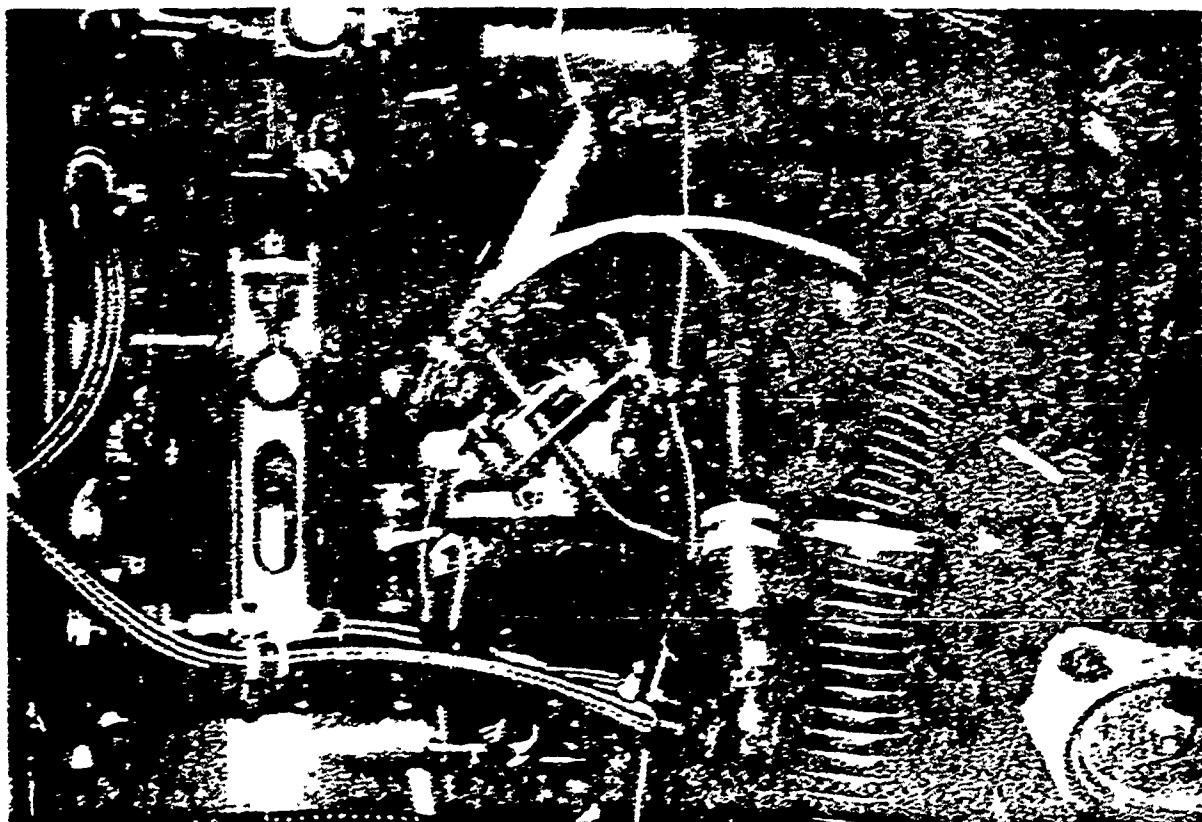
FIGURE 4-17



FUEL FLOW AND TEMPERATURE SENSOR INSTALLATION  
THE UH-1H AIRCRAFT

UH-1H AIDAPS TEST BLD PROGRAM

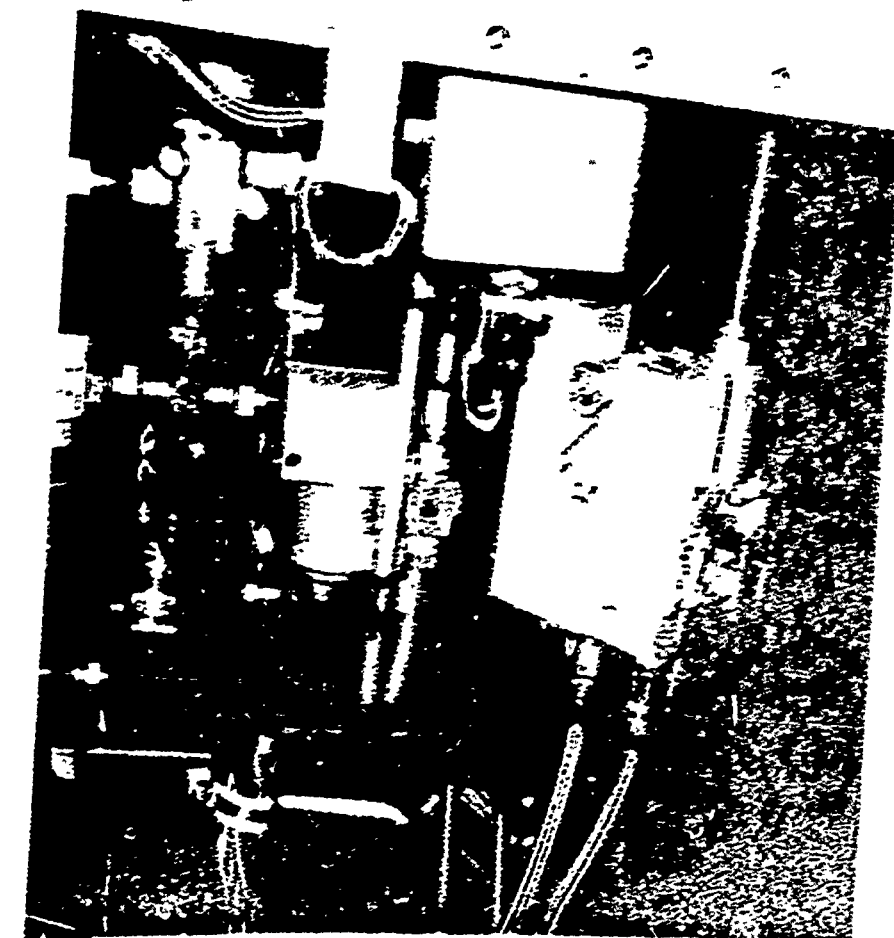
FIGURE L-1f



AIRCRAFT INSTALLATION OF THE I.G.V. SYNCHRO  
FOR THE LI3 ENGINE

UN-III AIDAPS TEST BED PROGRAM

FIGURE 4-19



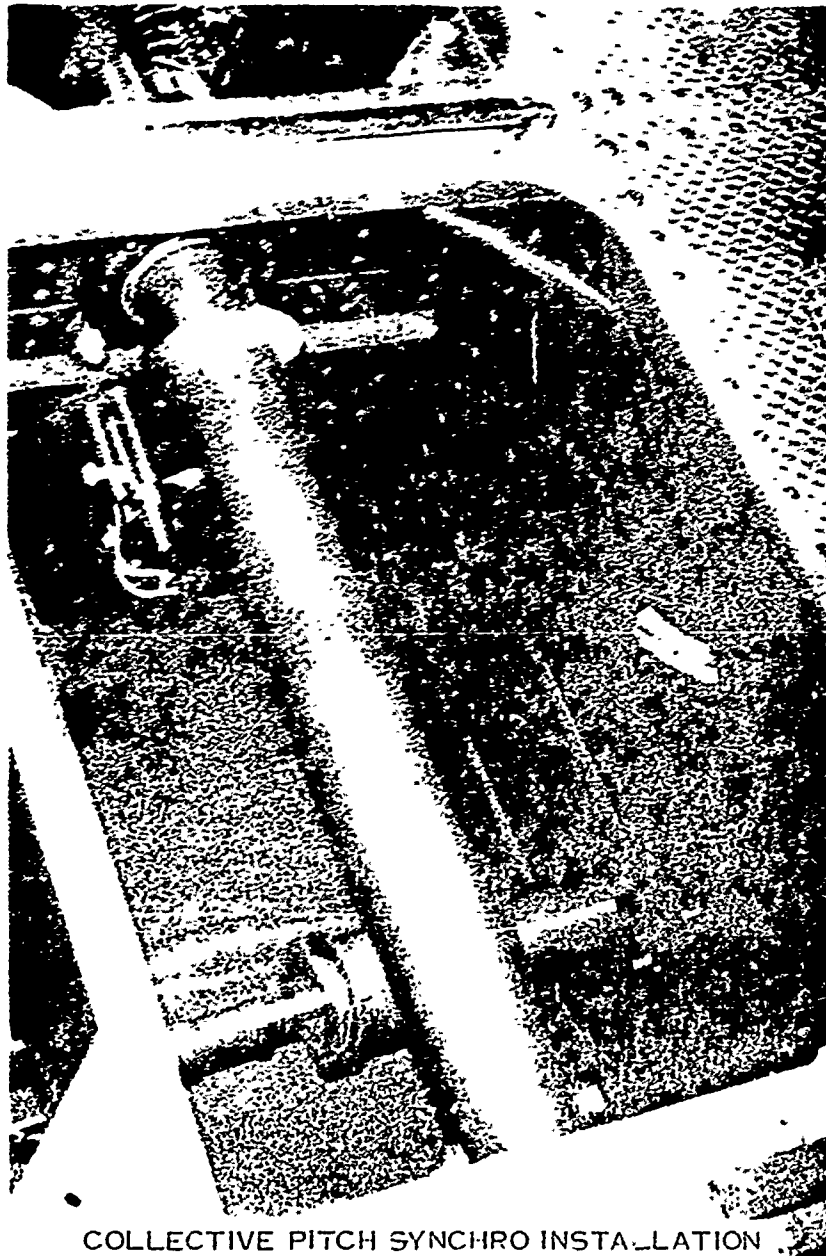
HYDRAULIC FILTER DELTA P INSTALLATION  
ON THE UH-1H AIRCRAFT

FIGURE 4-20



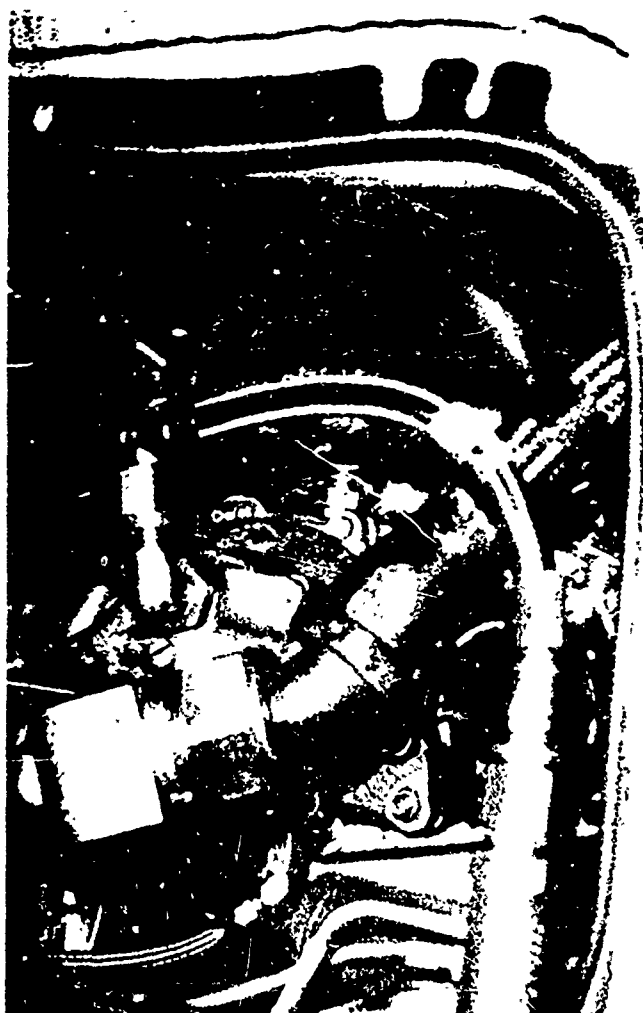
BLEED BAND SWITCH ON THE  
L13 ENGINE

FIGURE 4-21



COLLECTIVE PITCH SYNCHRO INSTALLATION  
ON THE UH-1H AIRCRAFT

FIGURE 4-22



HYDRAULIC BYPASS TEMPERATURE AND FLOW METER  
INSTALLATION ON THE UH-1H AIRCRAFT

FIGURE 4-23

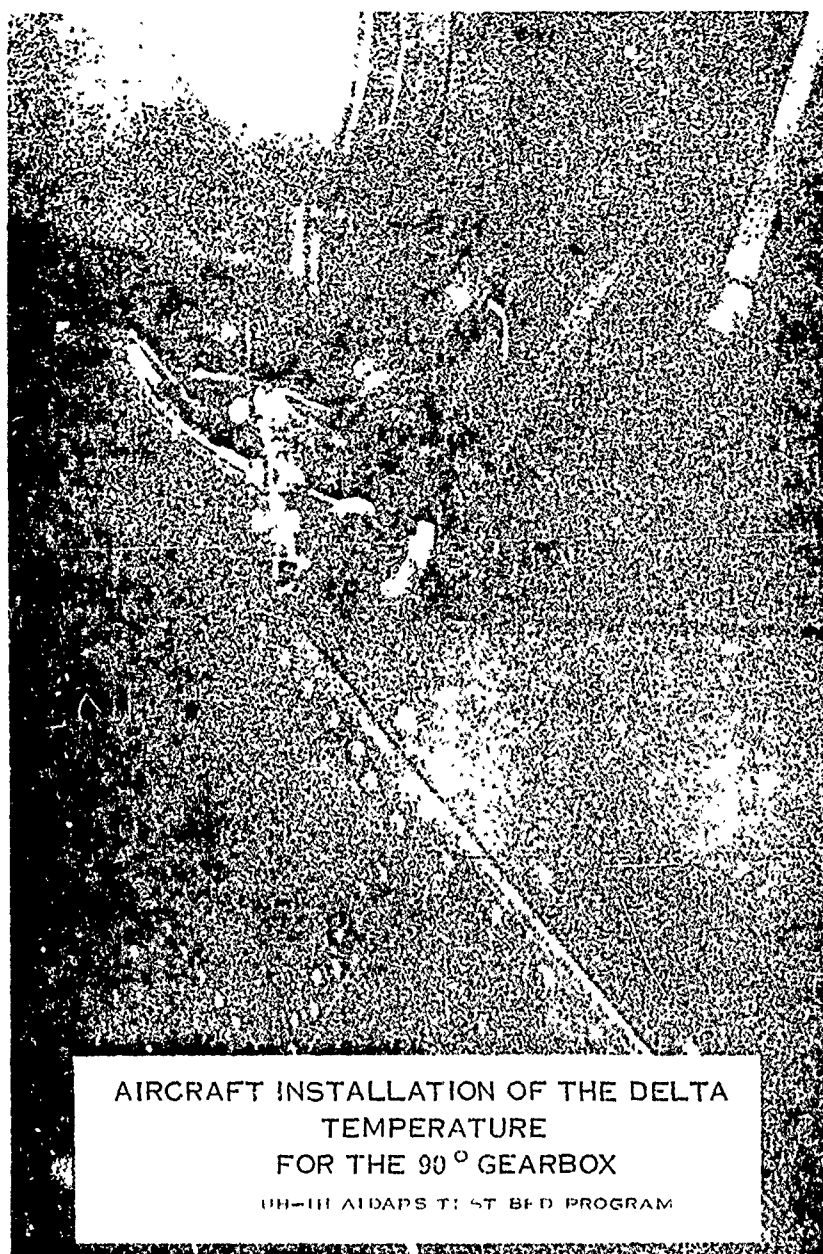
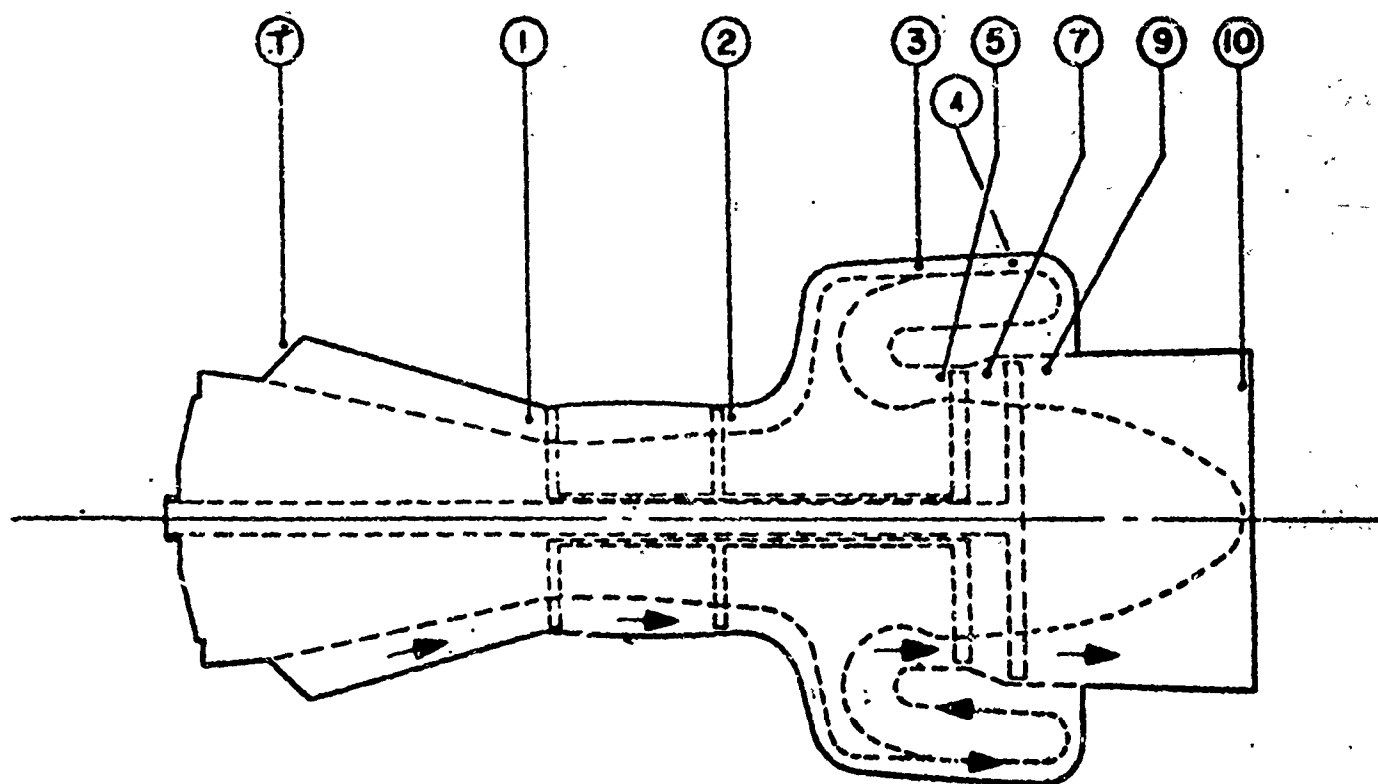


FIGURE 4-24



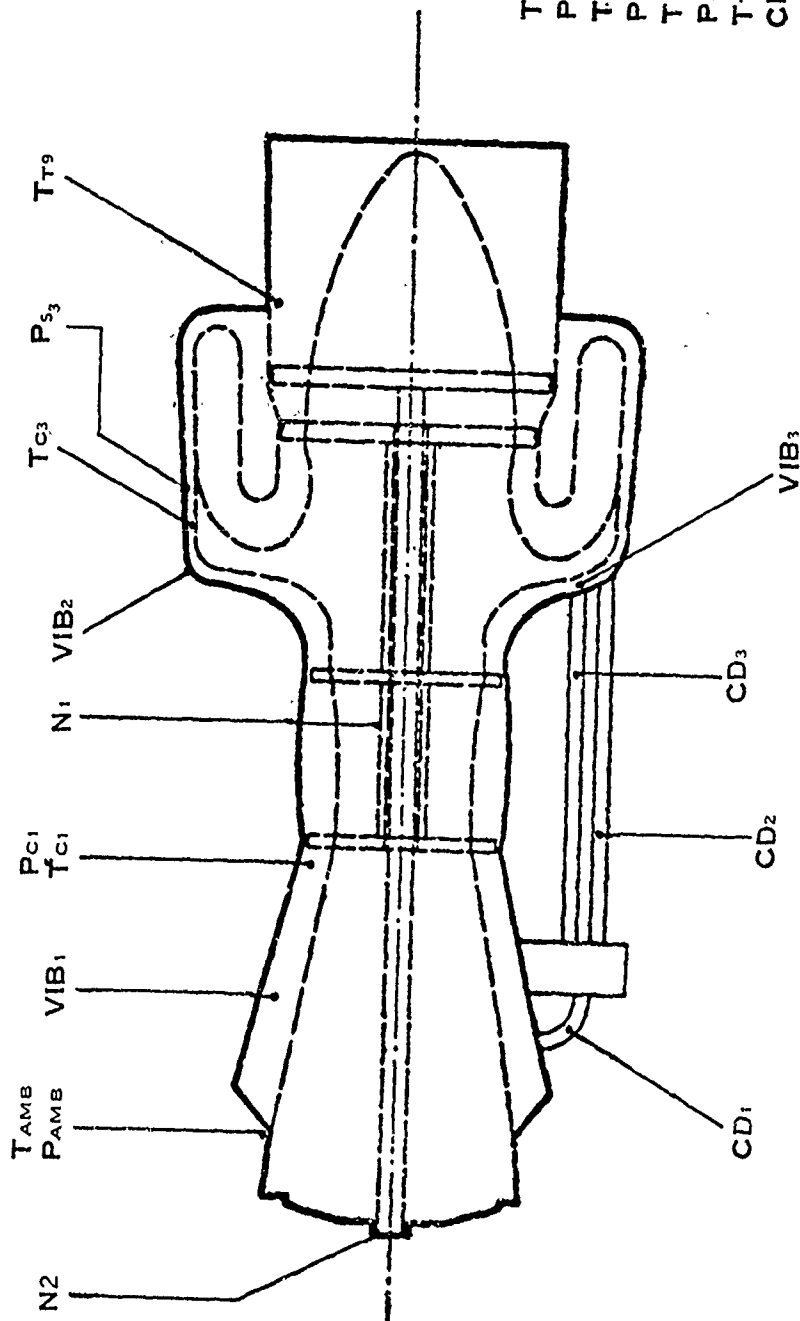


- |                                   |                                 |
|-----------------------------------|---------------------------------|
| ① ENGINE INLET                    | ⑤ GAS PRODUCER TURBINE ENTRANCE |
| ① AXIAL COMPRESSOR ENTRANCE       | ⑦ POWER TURBINE ENTRANCE        |
| ② CENTRIFUGAL COMPRESSOR ENTRANCE | ⑨ EXHAUST DIFFUSER ENTRANCE     |
| ③ COMPRESSOR DIFFUSER EXIT        | ⑩ EXHAUST DIFFUSER EXIT         |
| ④ COMBUSTOR STATIC PORT           |                                 |

FIGURE 4-25 T53 ENGINE STATION DIAGRAM UH-1H

# T53 PRIMARY ENGINE SENSORS UH-1H

62 88



TAMB	AMBIENT TEMPERATURE
PAMB	AMBIENT PRESSURE
Tc1	COMPRESSOR INLET TEMP.
Pc1	COMPRESSOR INLET PRESS.
Tc3	COMPRESSOR DISCHARGE TEMP.
P53	COMPRESSOR DISCHARGE TEMP.
T79	EXHAUST GAS TOTAL TEMP.
CD1	FWD ENGINE COMPONENTS
CD2	NO. 2 BEARING SCAVENGE LINE
CD3	POWER TURBINE BEARING
N1	GAS PRODUCER SPEED
N2	POWER TURBINE SPEED
VIB1	VIBRATION FWD.
VIB2	VIBRATION AFT.
VIB3	VIBRATION 3/4 SCAVENGE LINE

FIGURE 4-26

# TRANSMISSION SENSORS UH-1H

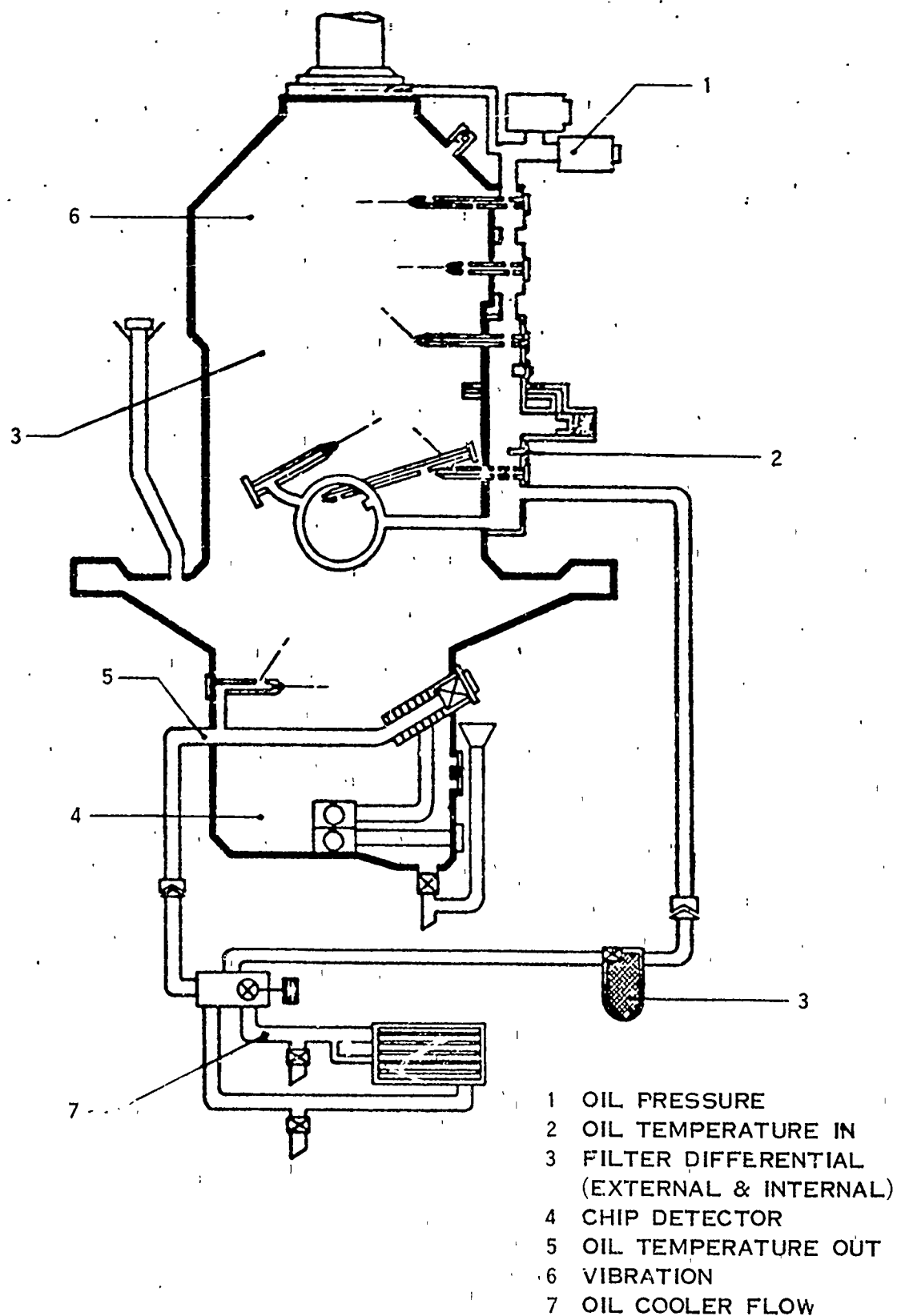
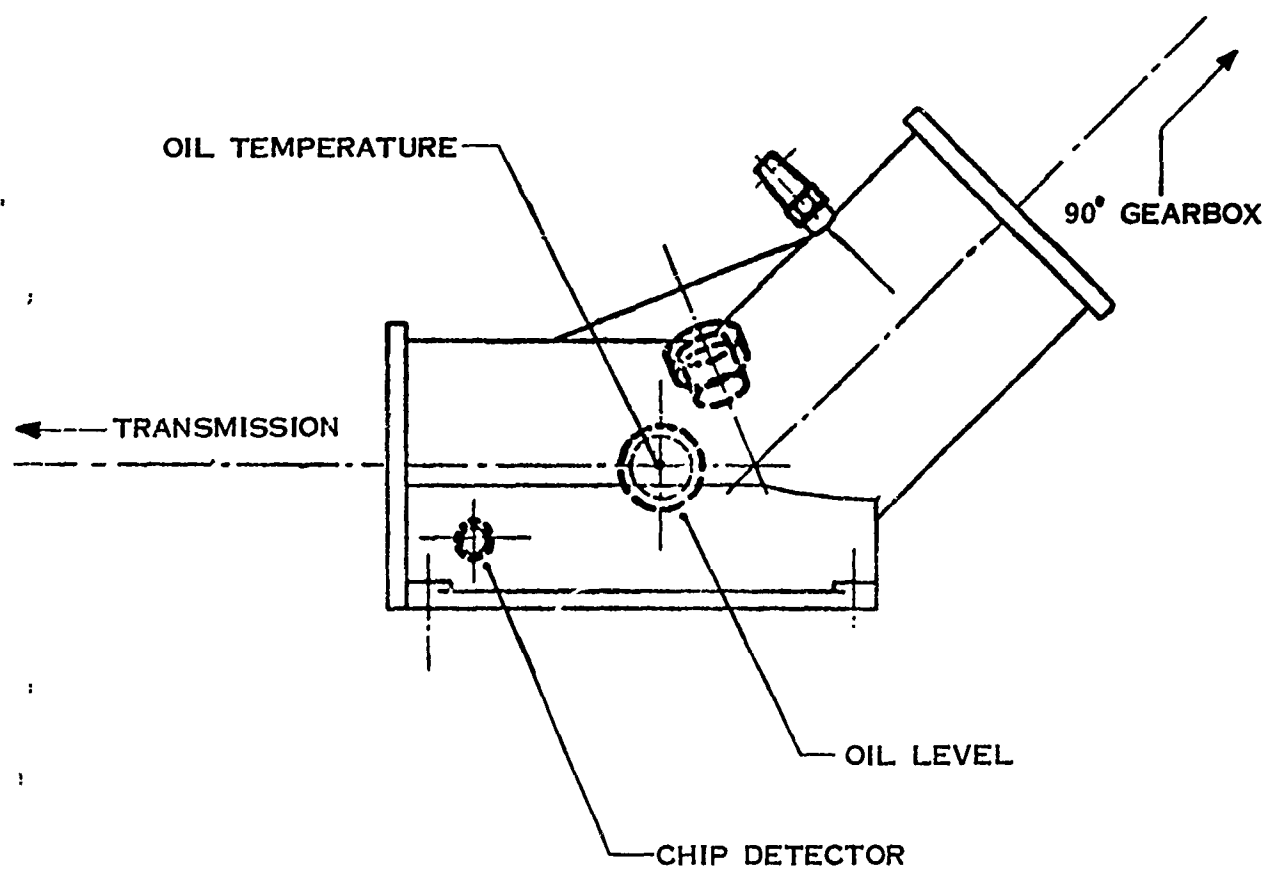


FIGURE 4-27

## 42° GEARBOX SENSORS UH-IH



## 90° GEARBOX SENSORS UH-1H

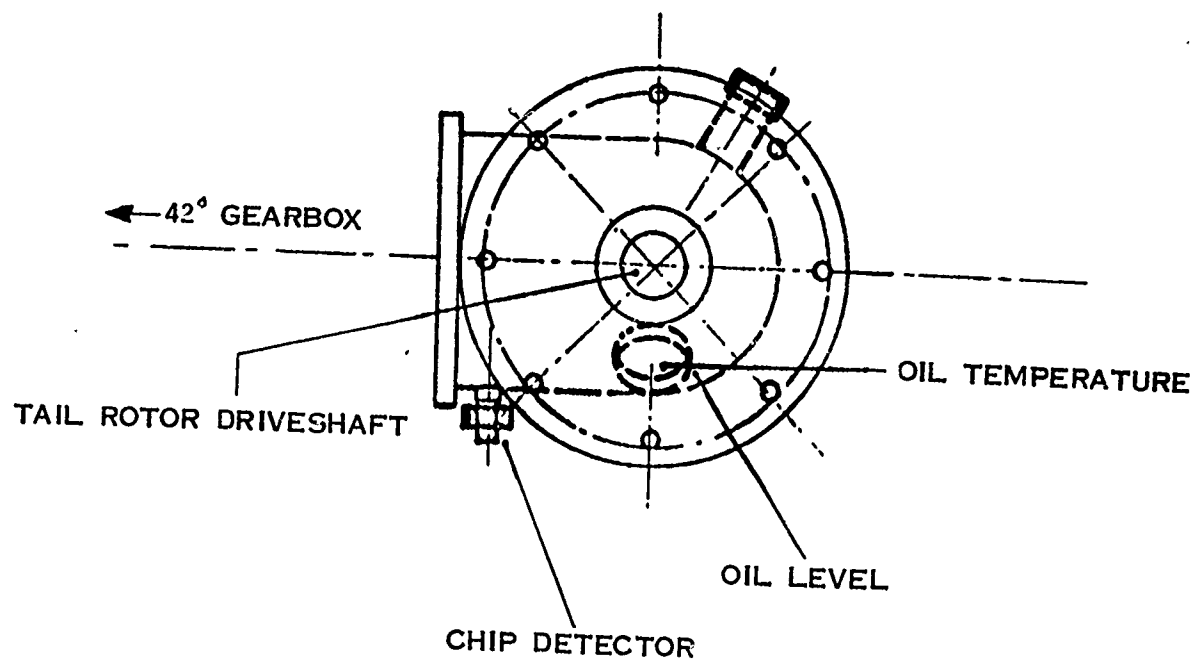


FIGURE 4-29

PARAMETER	PARAMETER	SENSOR TYPE	RANGE	VENDOR	MODEL	ACCURACY
1	Eng. #2 Bearing oil scavenge pressure	Pressure Switch	Open 2psi; close 2psi	Custom Components	70313	±.1 psi
2	Eng. #2 bearing oil Temp	Iron constantin thermocouple	0 to 300°F	ALD	---	±.6°F
3	Eng. #2 bearing chip detector	Chip Detector	Open 2K short	ALD	---	---
4	Compressor FOD. #2 bearing	Velocity Pickup	.100 inches peak to peak	CEC	4-124-0001	±.4
5	EGT Average	Chromel-alumel thermocouple	320°F to 1400°F	Existing	---	±.4°F
6	EGT (individual) thru i	Chromel-alumel thermocouple	320°F to 1700°F	Existing	---	±.4°F
7	#3 and #4 Bearing	Velocity Pickup	.100 inches peak to peak	CEC	4-123-0001	±.4
8	Compressor FOD	Accelerometer	100 g's	CEC	4-231-0001	±.1
9	Eng. #3/4 bearing oil scavenge pressure	Pressure Switch	Open 2psi; close 2psi	Custom Components	70313	±.1 psi
10	Eng. #3/4 bearing oil Temp	Iron Constantin thermocouple	0 to 300°F	ALD	---	±.6°F
11	Eng. #3/4 bearing chip detector	Chip Detector	Open 2K short	ALD	---	---
12	Eng. Accessory G. B. chip detector	Chip Detector	Open 2K short	ALD	---	---
13	Compressor Discharge Pressure (P <sub>2</sub> )	Strain Gage Pressure Sensor	0 to 100 psi	Taber	Series 163	±.012 psi
14	Compressor Discharge Temp. (T <sub>2</sub> )	Chromel-Alumel Thermocouple	320°F to 600°F	ALD	Series 167	±.012 psi
15	Engine Inlet Pressure (P <sub>1</sub> )	Strain Gage Pressure Sensor	0 to 30 psi	Taber	---	±.012 psi
16	Engine Inlet Temp. (T <sub>1</sub> )	Platinum Resistance Probe	0 to 1640°F	ALD	---	±.4°F
17	Gas Generator Speed (N <sub>1</sub> )	Tachometer	25 to 110	Existing	---	---
18	Power Turbine Speed (N <sub>2</sub> )	Tachometer	25 to 110	Existing	---	---
19	Power Lever Angle (PLA)	Synchro	Min/Max	Harowe	9CN-200-A-1	±.11, ± min.
20	Fuel Flow (W <sub>F</sub> )	Turbine Flow Meter	.167 to 2.5 gal min	Cox	ANA-4	±.3%
21	Left Fuel Boost Pump Flow Sev.	Flow Switch	Open 60pph; close 60pph	Existing	---	---
22	Right Fuel Boost Pump Flow Sev.	Flow Switch	Open 60pph; close 60pph	Existing	---	---
23	Fuel Pressure	Synchro Transmitter	0 to 30 psi	Existing	---	---
24	Engine Driven Fuel Pump Press. Sev.	Pressure Switch	Open 45psi; close 45 psi	Hydromatic Co.	40210	±.5 psi
26	Eng. Fuel Filter P Sev.	Pressure Switch	open 11psi; close 11psi	Westport Dev.	CG12829	±.1 psi
29	Eng. Lube Oil Temp.	Resistance Bulb	0 to 350°F	Existing	---	---
30	Eng. Lube Oil Pressure	Variable Reluctance Press. Sen.	0 to 100 psi	Existing	---	---
31	Eng. Oil Filter P Sev.	Pressure Switch	open 11psi; close 11psi	Westport Dev.	CG12829	±.1 psi
32	Torque	Variable Reluctance Press. Sen.	0 to 1650 ft. lbs.	Existing	---	---
34	Bleed Band Position	Switch	Open/Closed	Microswitch	---	---
36	Battery Voltage at Start	DC Voltage	0 to 35 VDC	Existing	---	---
37	Engine Ignition Excites	Switch	On/Off	Existing	---	---
38	XMSEN Oil Pressure Switch	Pressure Switch	open 30psi; close 30psi	Existing	---	---
39	XMSEN Oil Pressure	Variable Reluctance Press. Sen.	0 to 100 psi	Existing	---	---
40	XMSEN Oil Temp.	Temp. Switch	open 110°C; close 110°C	Existing	---	---
41	XMSEN Oil Temp.	Resistance Bulk	0 to 350°F	Existing	---	---
42	XMSEN Oil Sump Chip Detector	Chip Detector	Open/2K short	Existing	---	---
43	Input Quill Ball Bearing	Velocity Pickup	.140 inches peak to peak	N. B. Electronics	Type 11	±.3
47	Main Mast Bearing - Axial	Velocity Pickup	.200 inches peak to peak	N. B. Electronics	Type 14	±.3
49	Sump Input & Tailrotor Quill Bearings	Variable Reluctance Press. Sen.	.140 inches peak to peak	N. B. Electronics	Type 11	±.3
51	XMSEN Ext. Oil Fil. P	Chromel-Alumel Thermocouple	Open 15psi; close 15psi	Dynastencel	MD-25 paid	±.012 psi
58	42° G. B. Oil Temp. (T)	Velocity Pickup	0 to 160°F	ISD	---	±.4°F
59	Input Output Quill Bearings	Accelerometer	.100 g's	N. B. Electronics	Type 11	±.3
61	Gearmesh - 42° G. B.	Chromel-Alumel Thermocouple	.140 inches peak to peak	Columbia	1111-1	±.4°F
63	90° G. B. Oil Temp. (T)	Velocity Pickup	0 to 160°F	ISD	---	±.4°F
64	Input Quill Bearings & Gearmesh	Velocity Pickup	.140 inches peak to peak	N. B. Electronics	Type 11	±.3
66	Output Quill Bearings	Velocity Pickup	.140 inches peak to peak	N. B. Electronics	Type 11	±.3

TABLE 4-1 SENSOR CHARACTERISTICS

PARAMETER	PARAMETER	SENSOR TYPE	RANGE	VENDOR	MODEL	ACCURACY
69	Hydraulic Pressure Switch	Pressure Switch	open 600psi; close 300psi	Exsting	---	---
70	Hydraulic Supply Pressure	Variable Reluctance Press. Sen.	0 to 1500 psig	Dynasciences	P3D 1300 psid	±10.0 psig
71	Hydraulic Supply Temp.	Chromel-Alumel Thermocouple	32 to 160°F	HSD	---	±.00°F
72	Hydraulic Filter P	Variable Reluctance Press. Sen.	open 60psi; close 60 psid	Dynasciences	P7D 100 psid	±.3 psid
77	Total Pressure (PT)	Strain Gage Pressure Sensor	0 to 35 psia	Statham	PA872-35	±.15 psia
78	Static Pressure (PS)	Strain Gage Pressure Sensor	0 to 35 psia	Statham	PA872-35	±.15 psia
80	Collective Pitch Stick Position	Synchro	Up/Down	Harowe	8CX-200-A-1/7	±11.0 min.
87	Overspeed Governor Switch	Switch	Auto/Emergency	Exsting	---	---
90	42° G. B. Chip Detector	Chip Detector	open/2K short	Exsting	---	---
91	90° G. B. Chip Detector	Chip Detector	open/2K short	Exsting	---	---
101	XMSN Oil Cooler Flow	Turbine Flowmeter	0.5 to 15 gpm	Cox	AN10	±.3%
102	Main Rotor RPM (Nri)	Tachometer	25 to 1107	Exsting	---	---
103	XMSN Int. Oil Fil. P	Variable Reluctance Press. Sen.	open 20psi; close 30psi	Dynasciences	P7D 30 psid	±.1 psid
107	Hydraulic Pump Case Leakage Flow	Turbine Flowmeter	0.05 to 0.5 gpm	Cox	L7M-1	±.007
108	Hydraulic Pump Case Leakage Flow T	Chromel-Alumel Thermocouple	0 to 50°F	HSD	---	±.00°F
109	28 VDC Essential Buss	DC Voltage	0 to 35 VDC	---	---	---
110	115 VAC Essential Buss	AC Voltage	0 to 130 VAC	---	---	---
111	26 VAC Instrument Buss	AC Voltage	0 to 35 VAC	---	---	---
112	Hi/Lo RPM Warning Light	Switch	On/Off	---	---	---
113	Hi/Lo RPM Warning Audio	Switch	On/Off	---	---	---
119	IGV Angle	Synchro	Open/Closed	Harowe	8CX-200-A-1/7	±11.0 min.
120	Inlet Air Filter P Switch	Pressure Switch	open 8 ftO; closed 5 ftO	Exsting	---	---
121	Engine Oil Pressure Switch	Pressure Switch	open 25 psig; closed 25 psig	Exsting	---	---
122	Fuel Temp.	Chromel-Alumel Thermocouple	32°F to 160°F	HSD	---	±.00°F
123	Main Mast Bearing - radial	Velocity Pickup	.140 inches peak to peak	M. D. Electronics	Type 11	±.01
125	Input Quill Gearmesh	Accelerometer	±100 g's	Columbia	1111-1	±.01
127	Tail Rotor Quill Gearmesh	Accelerometer	±100 g's	Columbia	1111-1	±.01
129	Hyd. Pump and Tach. Quill Bearings	Velocity Pickup	.140 inches peak to peak	M. D. Electronics	Type 11	±.01

TABLE 4-1 CONTINUED

TABLE 4.2

HSER 6080  
Volume II

## CHRONOLOGICAL LISTING OF HARDWARE PROBLEMS

DATE	PROBLEM	CORRECTIVE ACTION
1/1/71 thru 1/15/71	Misc. Aircraft Wiring Discrepancies after completion of installation (Phase C)	Corrected Wiring errors
1/20/71	Hyd. by-pass flow readings erratic	Defective flowmeter; returned to manufacturer for repair under warranty
2/17/71 and 2/18/71	Malfunction of DDP Hb ground based computer	Contacted Honeywell Rep. who repaired multiply and divide P.C. card
2/24/71	Recorder problem - tape not moving in cassette	Repaired defective cassette.
3/1/71	MEU unit #1 - Error in thermocouple readings	Replaced defective filtering capacitors
3/12/71	Fuel flow signal scattered (A/C 011)	Replaced flowmeter and modified adapter
	<u>Note:</u> On A/C 011, Misc. repairs to engine harnessing were necessary due to removing & replacing of engines with discrepant parts.	
4/13/71	MEU Unit #1 - power supply problem, 5V power supply failed.	Replaced power transistor in regulator circuit.
4/20/71	A/C #011 - Fuel temp. inoperative	Found broken wire on thermocouple due to engine change, replaced thermocouple



TABLE 4.2 (CONTINUED)

HSEK 6380  
Volume II

DATE	PROBLEM	CORRECTIVE ACTION
5/25/71	MEU Unit #1 hydraulic pump bypass readout inoperative	Replaced operational amplifier in signal conditioning circuitry
6/10/71	MEU #1, foreign matter in electronics units due to aircraft landing on beach	MEU #1 disassembled, cleaned, reassembled, and tested
6/21/71	A/C #1011, $T_1$ probe damaged on installation	replaced $T_1$ probe
7/8/71	A/C 1011, Hydraulic supply pressure transducer failed	Replaced transducer
7/20/71	MAAP failed to operate correctly	Found broken wire in MEU #1 replaced broken wire
7/30/71	A/C #1011, #2 bearing $\Delta T$ thermocouple intermittent	repaired thermocouple
8/9/71	MEU #1, +28 volt supply failed due to broken connector on engine harness on A/C #1011	Replaced connector and repaired +28V supply.
8/10/71	A/C #1011, EGT (average) readout incorrect	Found engine EGT harness to be shorted. Repaired harness
8/16/71	A/C #1011, PLA signal not present	Replaced PLA sensor.
8/18/71	A/C #1011, $W_f$ signal intermittent	Replaced $W_f$ sensor
8/25/71	A/C #1011, $T_3$ probe intermittent	Replaced $T_3$ probe

Thru 8/31/71

TABLE 4.2 (CONTINUED)

DATE	PROBLEM	CORRECTIVE ACTION
9/14/71	Electrical connector on DC drift and cold junction compensation P.C. card was discovered to be broken	Connector replaced
9/14/71	Multiplexing circuit in AUX box defective	Replaced P.C. card

**SECTION 5**

**DATA ACQUISITION AND PROCESSING**

FIGURE 5-1

AIDAPS DATA COLLECTION AND ON SITE REVIEW

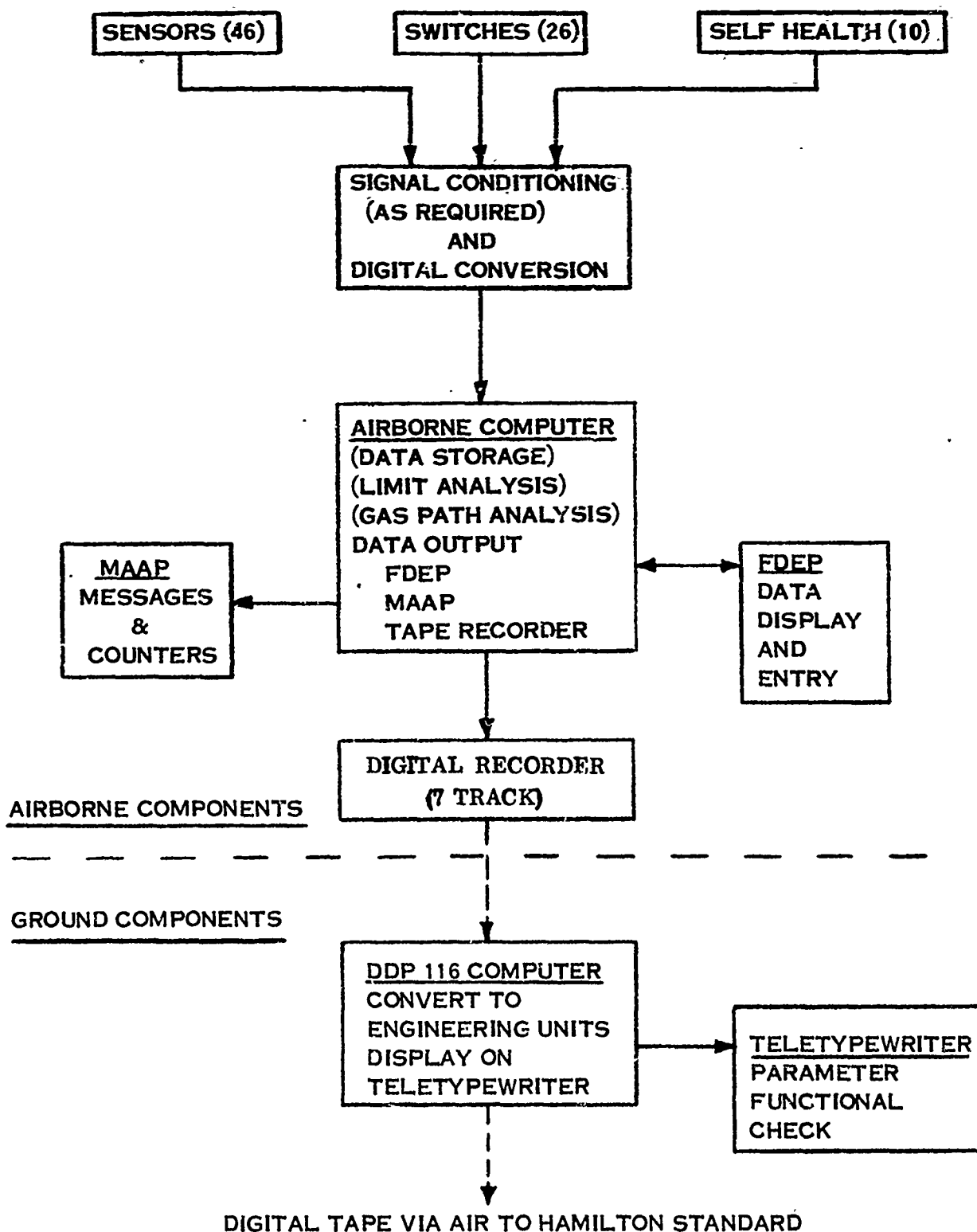


TABLE 5-1 AIDAPS PARAMETER DEFINITION

ENGINE PARAMETERS (GAS PATH)

NAME	SYMBOL	OPERATING RANGE	SAMPLES/FRAMES	LIMIT VALUE
Gas Producer Speed	N <sub>1</sub>	20000 to 26000 RPM	4	N/A
Power Turbine Speed	N <sub>2</sub>	6000 to 6600 RPM	4	
Fuel Flow	WF	200 to 900 PPH	4	
Power Turbine Torque	Q <sub>2</sub>	200 to 1600 ft. lbs.	4	
Compressor Discharge Pressure	PS3	40 to 110 psi	4	
Compressor Discharge Temperature	TT3	300 to 650°F	4	
Compressor Inlet Temperature	TT1	0 to 120°F	2	
Aircraft Total Pressure	P <sub>T</sub>	8 to 18 psi	2	
Average Exhaust Gas Temperature	TT9	700 to 1100°F	4	N/A

ENGINE PARAMETERS (MECHANICAL)

Exhaust Gas Ring Temperatures	EGT 1-12	500 to 1100°F	1 each	+200/-100°F
Aircraft Static Pressure	PS	8 to 16 psia	1	N/A
Compressor Inlet Static Pressure	PS1	8 to 16 psia	1	N/A
Engine Oil Temperature	EOT	Amb to 300°F	2	>250°F/150°F
Engine Oil Pressure	EOP	Amb to 100 psi	2	< 27 psi
Fuel Temperature	T Fuel		1	
Bearing 2 Differential Temperature	B2ΔT	Amb to 300°F	1	>220°F/190°F
Bearing 3 & 4 Differential Temperature	B3ΔT	Amb to 300°F	1	>220°F/190°F
Power Lever Angle	PLA	0 to 100%	4	N/A
Collective Pitch Angle	CPA	0 to 100%	4	N/A
Inlet Guide Vane Angle	IGV	0 to 100%	4	N/A
Fuel Pressure	P Fuel		4	< 4 psi
Accessory Gearbox Chip Detector	ACGCD		2	
Bearing 2 Chip Detector	B2CD		2	
Bearing 3 & 4 Chip Detector	B3CD		2	
Fuel Filter Differential Pressure Switch	FFΔP		2	> 11 psi
Right Fuel Pump Flow Switch	RBP SW		2	
Left Fuel Pump Flow Switch	LBP SW		2	
Inlet Air Filter Differential Pressure	Inlet Filter Δ P		2	
Engine Driven Fuel Pump Pressure Switch	Fuel Pump ΔP		2	
Oil Pressure Switch	EOP SW		2	
Oil Filter Differential Pressure Switch	EOF ΔP		2	> 11 psi
Bearing 3 & 4 Pressure Switch	B3P		2	> 8 psi
Bearing 2 Pressure Switch	B2P		2	> 8 psi
Bleed Band Position Switch	BBP SW		2	
Transmission Oil Temperature	TOT	0 to 300°F	2	> 230°F
Transmission Oil Pressure	TOP	0 to 100 psi	2	< 29 psi / > 70 psi
Oil Cooler Flow	OCF	.05 to 15 gpm	2	> 12 gpm
Oil Temperature Switch	TOT SW		2	
Oil Pressure Switch	TOP SW		2	
Internal Oil Filter Differential Pressure Switch	TIOF ΔP		2	> 20 psi
External Oil Filter Differential Pressure Switch	TEOF ΔP		2	> 15 psi
Oil Sample Chip Detector	TOCD		2	

TABLE 5-1 (CONT'D) AIDAPS PARAMETER DEFINITION

HYDRAULIC SYSTEM PARAMETERS

NAME	SYMBOL	OPERATING RANGE	SAMPLES/ FRAMES	LIMIT VALUE
Supply Pressure (high Switch)	HSP	0 to 1200 psi	2	< 500/>1150 psi
Supply Temperature	HST		2	N/A
Pump Bypass Flow	H.P. WF	.1 to 2. gpm	2	> 0.35 gpm
Pump Temperature Rise	Pump ΔT		2	> 50°F
Supply Pressure Switch (Low)	HSP SW		2	
Filter Differential Pressure Switch	HYD FILT ΔP		2	> 60 psi

GEARBOX PARAMETERS

42° Differential Temperature	G42ΔT	0 to 200°F	2	> 130°F
42° Chip Detector	G42CD		2	
90° Differential Temperature	G90ΔT		2	> 130°F
90° Chip Detector	G90CD			

ANCHILARY PARAMETERS

Rotor Speed	NR	280 to 350 RPM	4	> 335/< 295 rpm
Rotor Audio Alarm	Audio Alarm		2	
Rotor Light Alarm	Light Alarm		2	
Overspeed Governor Switch Position	Gov. SW.		2	
Ignition Exciter Switch Position	Ign. Ex. SW		2	
Starting Battery Voltage	SBV	15 to 30V	1	< 21V
115 VAC Essential Bus Voltage	ACEB	100 to 130V	1	> 120/< 110V
28 VAC Instrument Bus Voltage	ACI B	24 to 28V	1	> 26.6/< 25.4V
28 VDC Essential Bus Voltage	DCE B	24 to 30V	1	> 29/< 26V

FIGURE 5-2 COMPRESSOR PRESSURE FOR INITIAL STEADY STATE TEST

HAMILTON STANDARD UH-1 IFSI SFD PROGRAM

WINGS RC 17223 FLIGHT 05-10-AM

TIME 0900 HRS

DISCHARGE PRESSURE

COMPRESSOR

200.00 210.00 220.00 230.00 240.00 250.00

GAS PRODUCER SPEED  $\times 10^4$

81

FIGURE 5-3 COMPRESSOR TEMPERATURE FOR INITIAL STEADY STATE TEST

HAMILTON STANDARD UH 1 TEST BED PROGRAM

PILOTS AC 17225 FLIGHT 05-13-84

TIME 0900 HRS

COMPRESSOR DISCHARGE TEMPERATURE

800.00 850.00 900.00 950.00 1000.00 1050.00 1100.00 1150.00

200.00 210.00 220.00 230.00 240.00 250.00  
GAS PRODUCER SPEED  $\times 10^4$



FIGURE 5-4

FUEL FLOW FOR INITIAL STEADY STATE TEST

HAMILTON STANDARD LH 1 TEST BED PROGRAM  
 RUDAPS AT 1722G FLIGHT 05-13-AM  
 TIME 0900 HRS

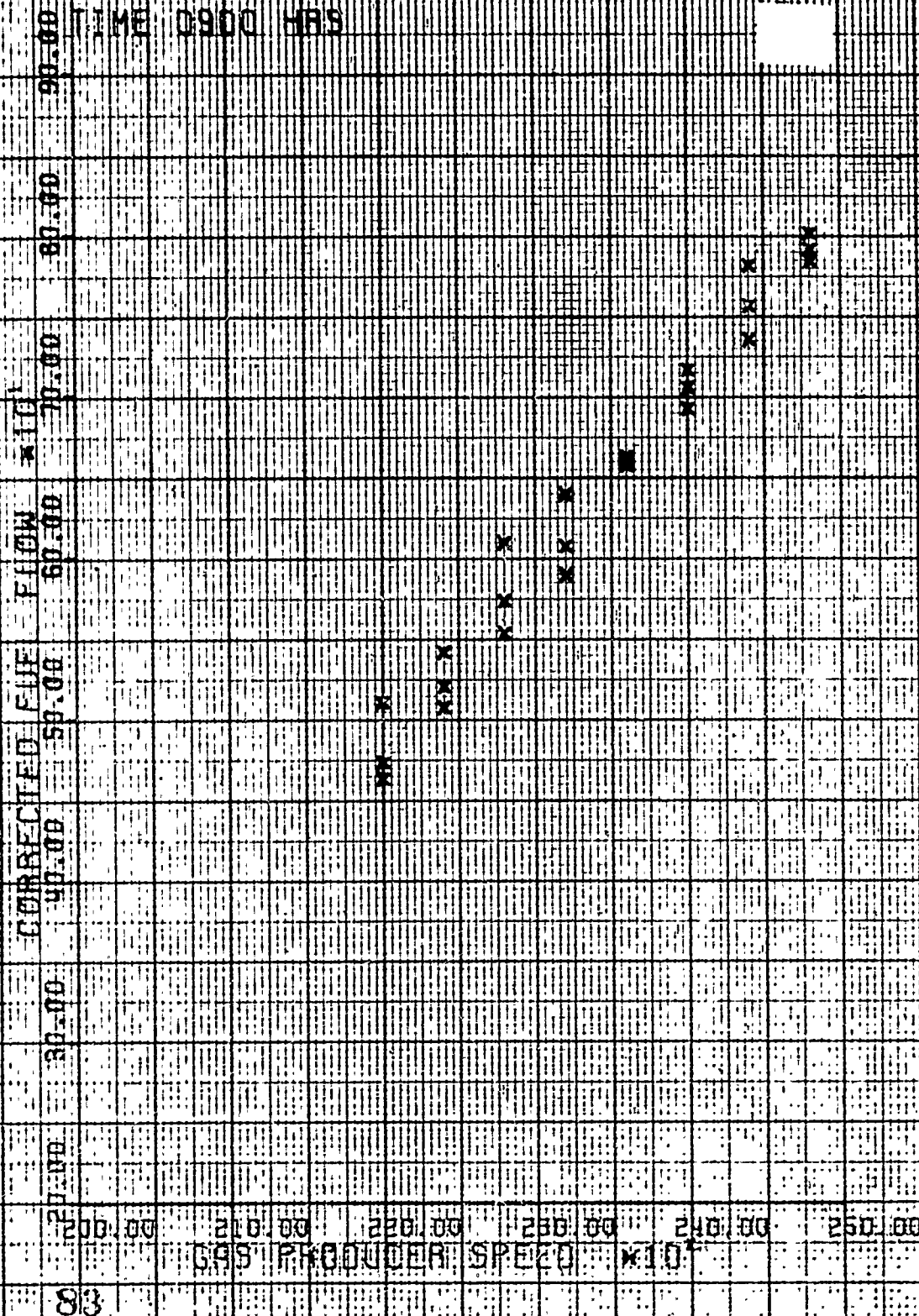


FIGURE 5-5 HORSEPOWER FOR INITIAL STEADY STATE TEST

HAMILTON STANDARD JH 1 TEST BED FRIEDMAN  
BIDERS NO 17223 FLIGHT 05-16-64  
TIME 0900 HRS

CORRECTED SHAFI HORSE POWER  $\times 10^3$

200.00 180.00 160.00 140.00 120.00 100.00 80.00 60.00 40.00 20.00 0.00

GAS PRODUCER SPEED  $\times 10^3$

200.00 210.00 220.00 230.00 240.00 250.00

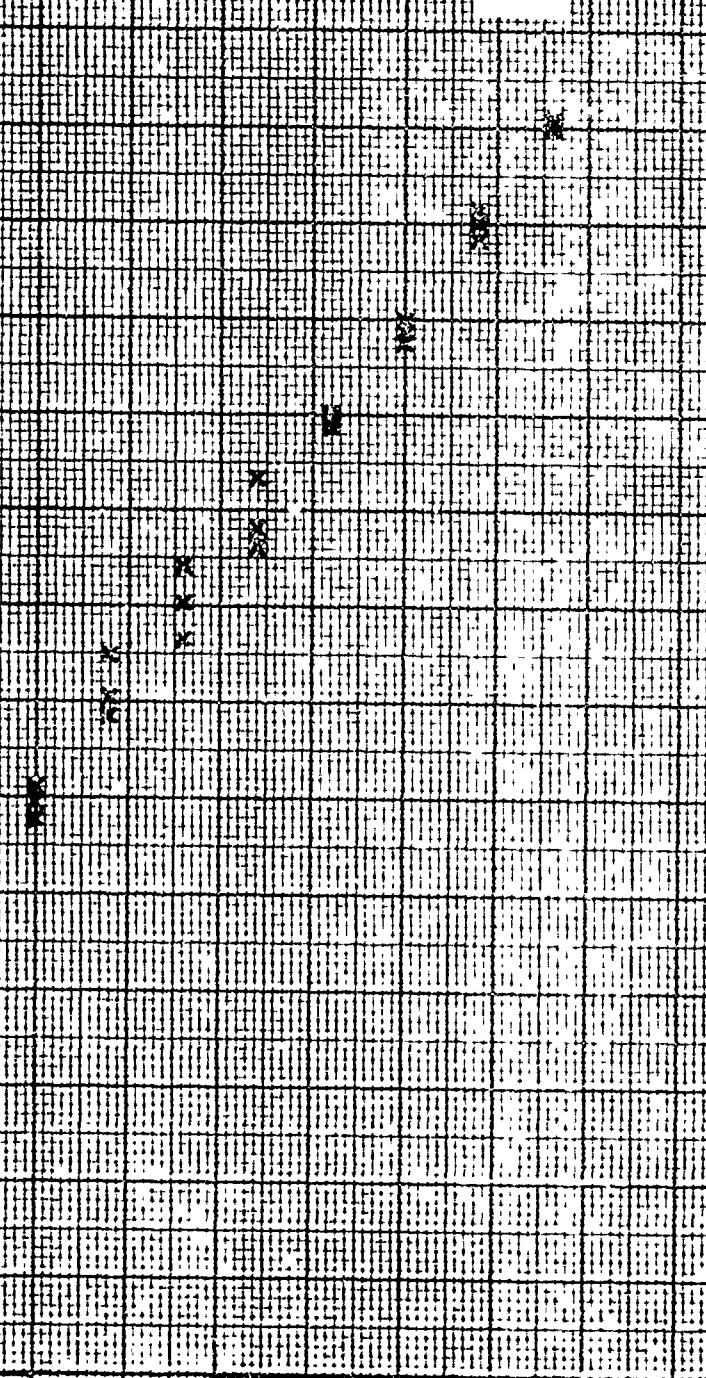


FIGURE 5-6, EXHAUST GAS TEMPERATURE FOR INITIAL STEADY STATE TEST

HAMILTON STANDARD LH 1 TEST BED FORD  
RIDEPS AT 17220 ALTITUDE 65-13-AM  
TIME 0900 HRS

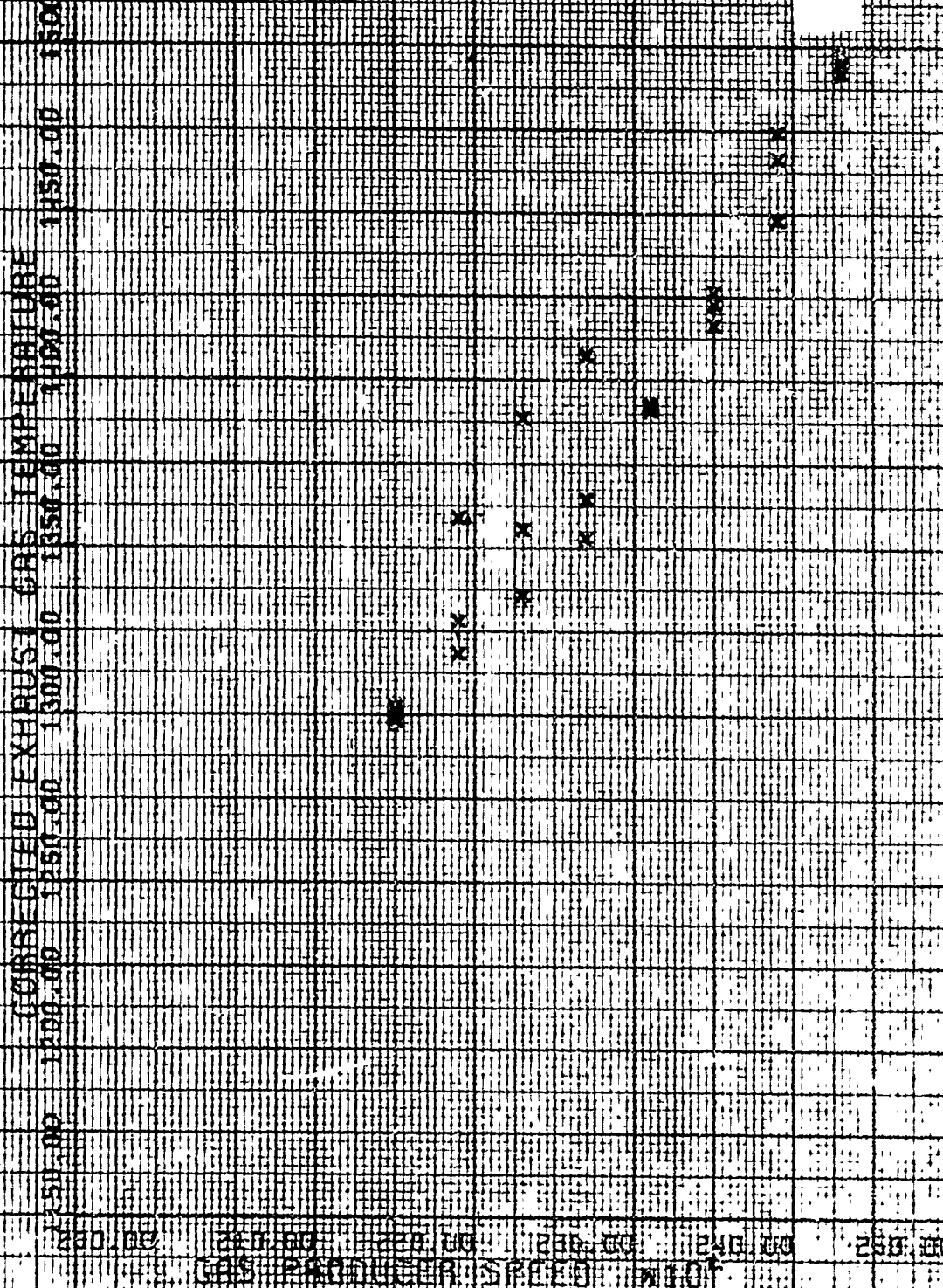




FIGURE 5-7 : COMPRESSOR PRESSURE FOR FINAL STEADY STATE TEST

HAMILTON STANDARD UH-1 TEST BED PROGRAM  
AIOAPS AC 17223 FLIGHT 05-13-AM  
TIME 0900 HRS.

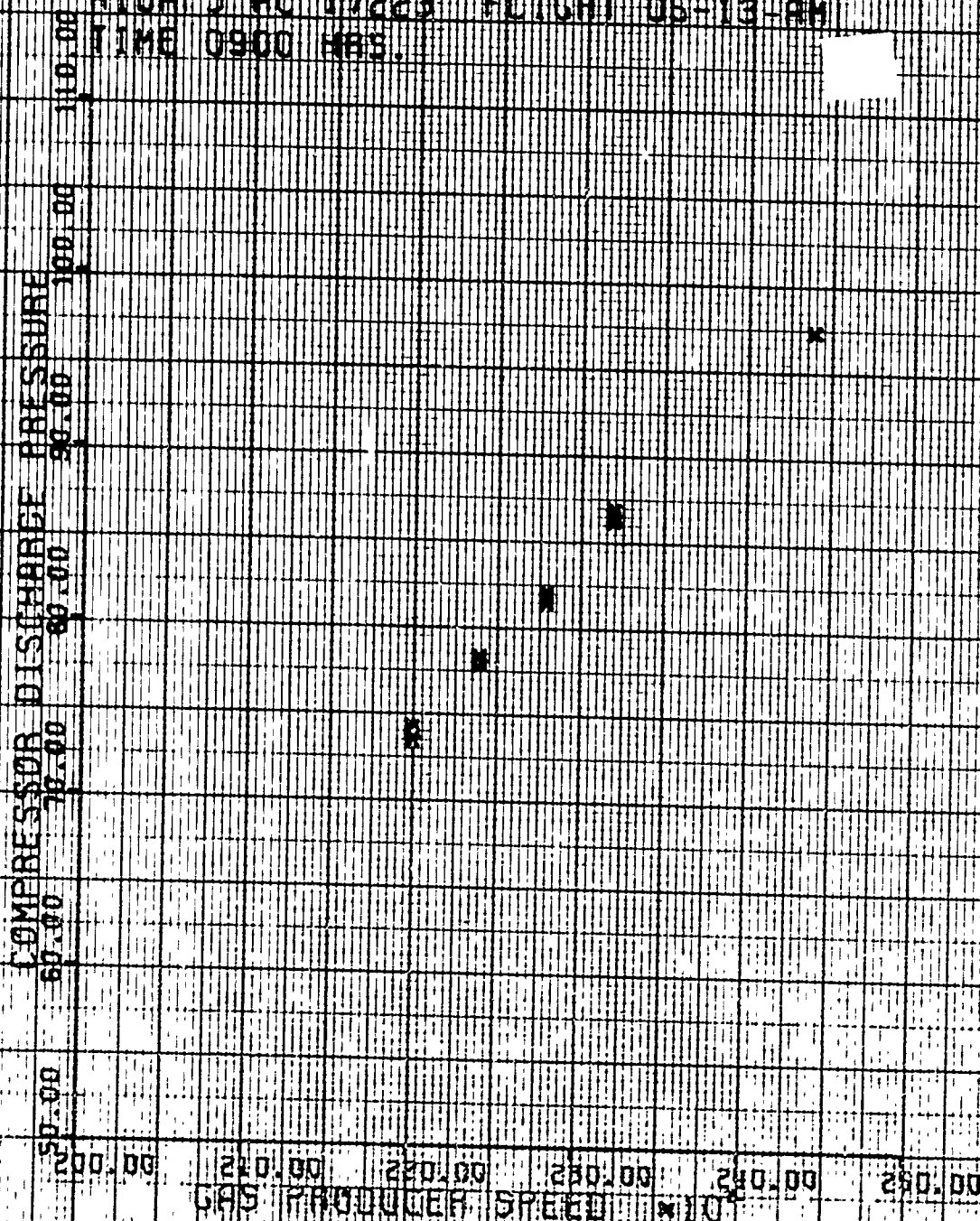


FIGURE 5-8 COMPRESSOR TEMPERATURE FOR FINAL STEADY STATE TEST

HAMILTON STANDARD UH 1 TEST BED PROGRAM

AIDAPS AC 17223 FLIGHT 05-13-AM

TIME 0900 HRS.

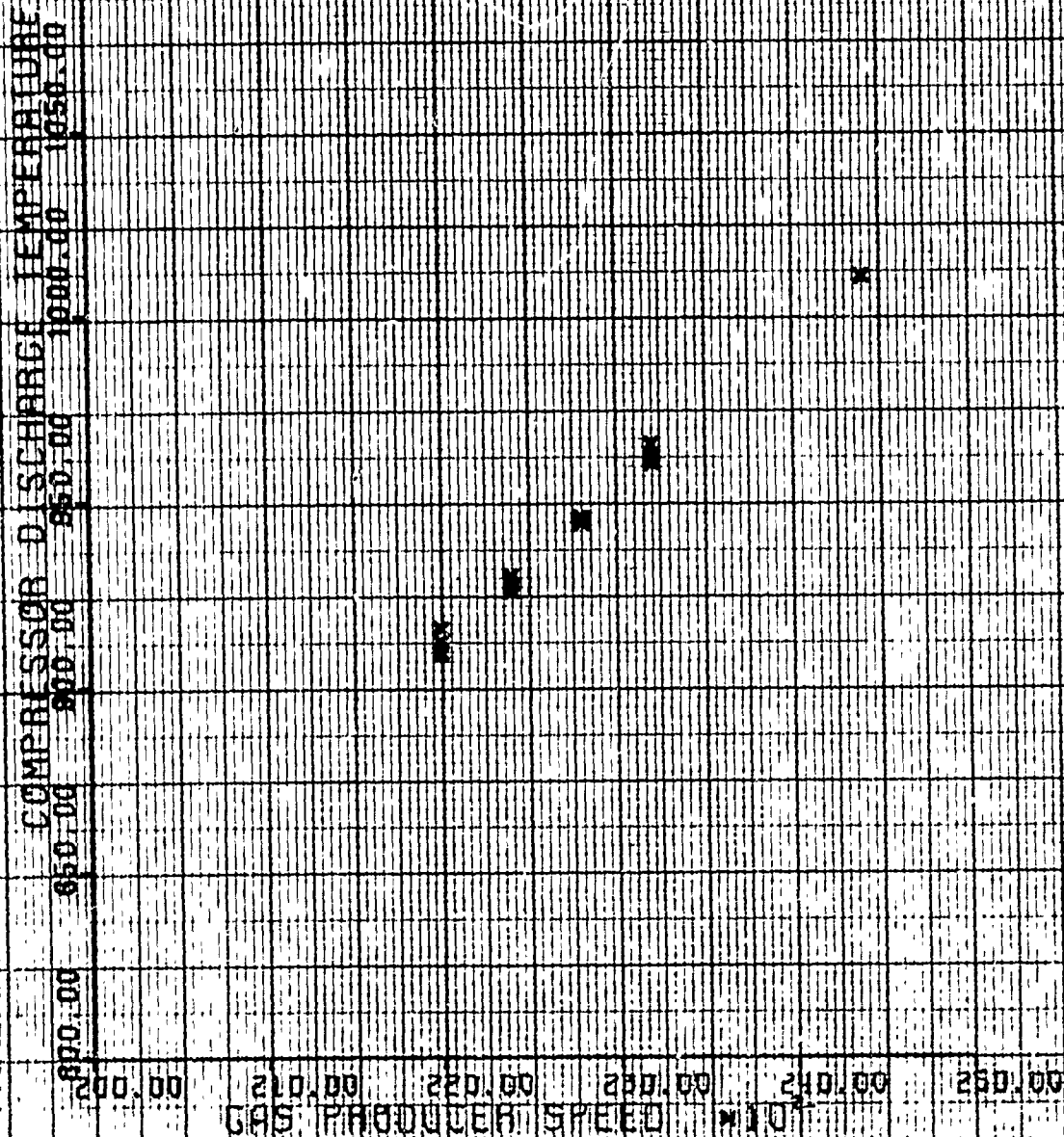


FIGURE 5-9 FUEL FLOW FOR FINAL STEADY STATE TEST

HAMILTON STANDARD UM I TEST BED PROGRAM  
R10RPS RC 17223 FLIGHT 08-13-AM  
TIME 0900 HRS.

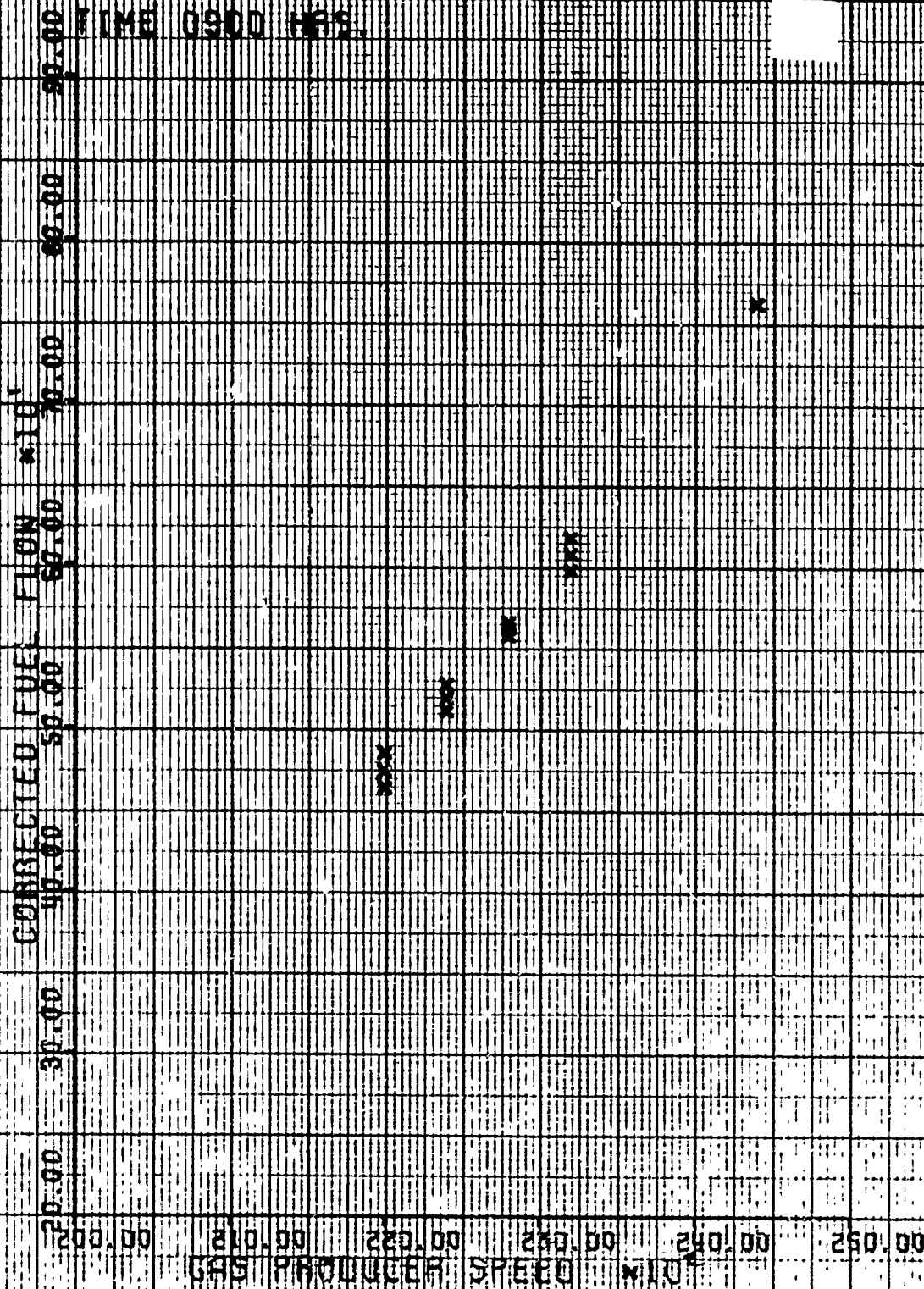


FIGURE 5-10 HORSEPOWER FOR FINAL STEADY STATE TEST

HAMILTON STANDARD UH-1 TEST BED PROGRAM  
R10APS AC 17223 FLIGHT 05-13-AM  
TIME 0900 HRS.

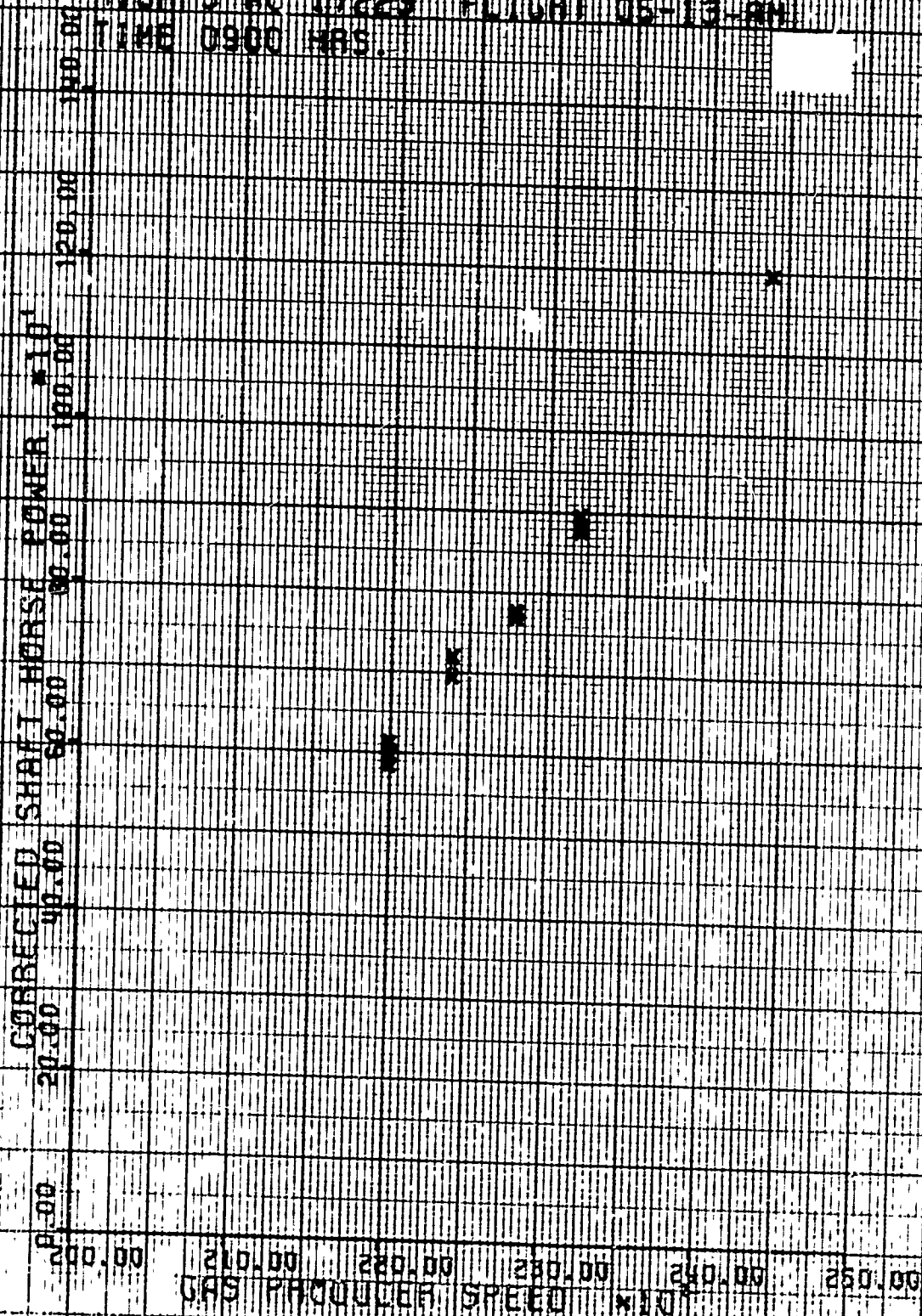




FIGURE 5-II EXHAUST GAS TEMPERATURE FOR FINAL STEADY STATE TEST

HAMILTON STANDARD UH-1 TEST BED PROGRAM  
R10RPS AC 17223 FLIGHT 05-13-AM  
TIME 0900 HRS.

CORRECTED EXHAUST GAS TEMPERATURE

1150.00 1200.00 1250.00 1300.00 1350.00 1400.00 1450.00 1500.00

200.00 210.00 220.00 230.00 240.00 250.00

GAS PRODUCER SPEED %10

90



FIGURE 5-12 GAS PRODUCER SPEED BASELINES  
FOR FLIGHT TEST ENGINES

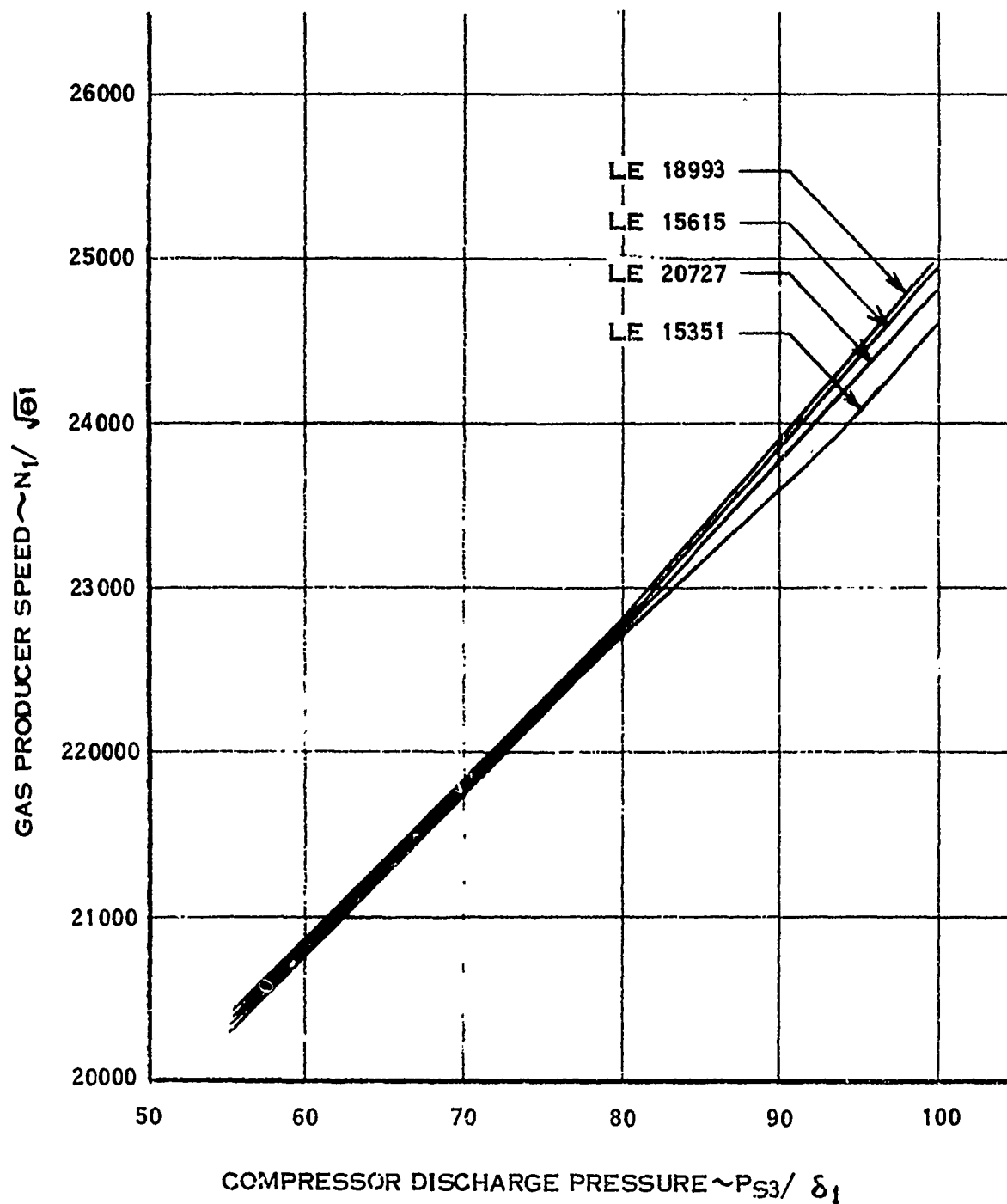


FIGURE 5-13 COMPRESSOR TEMPERATURE BASELINES FOR FLIGHT TEST ENGINES

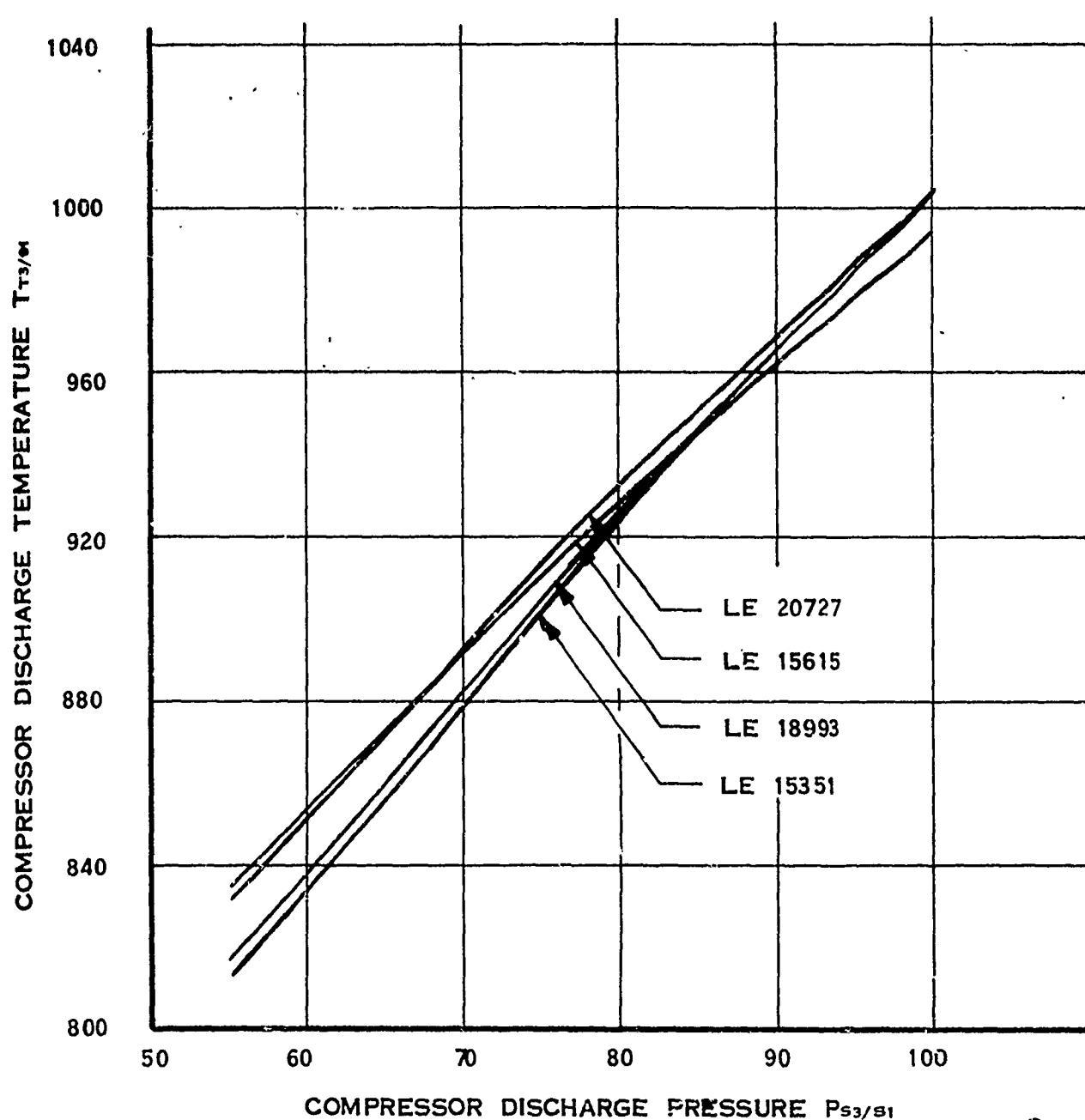


FIGURE 5-14 FUEL FLOW BASELINES  
FOR FLIGHT TEST ENGINES

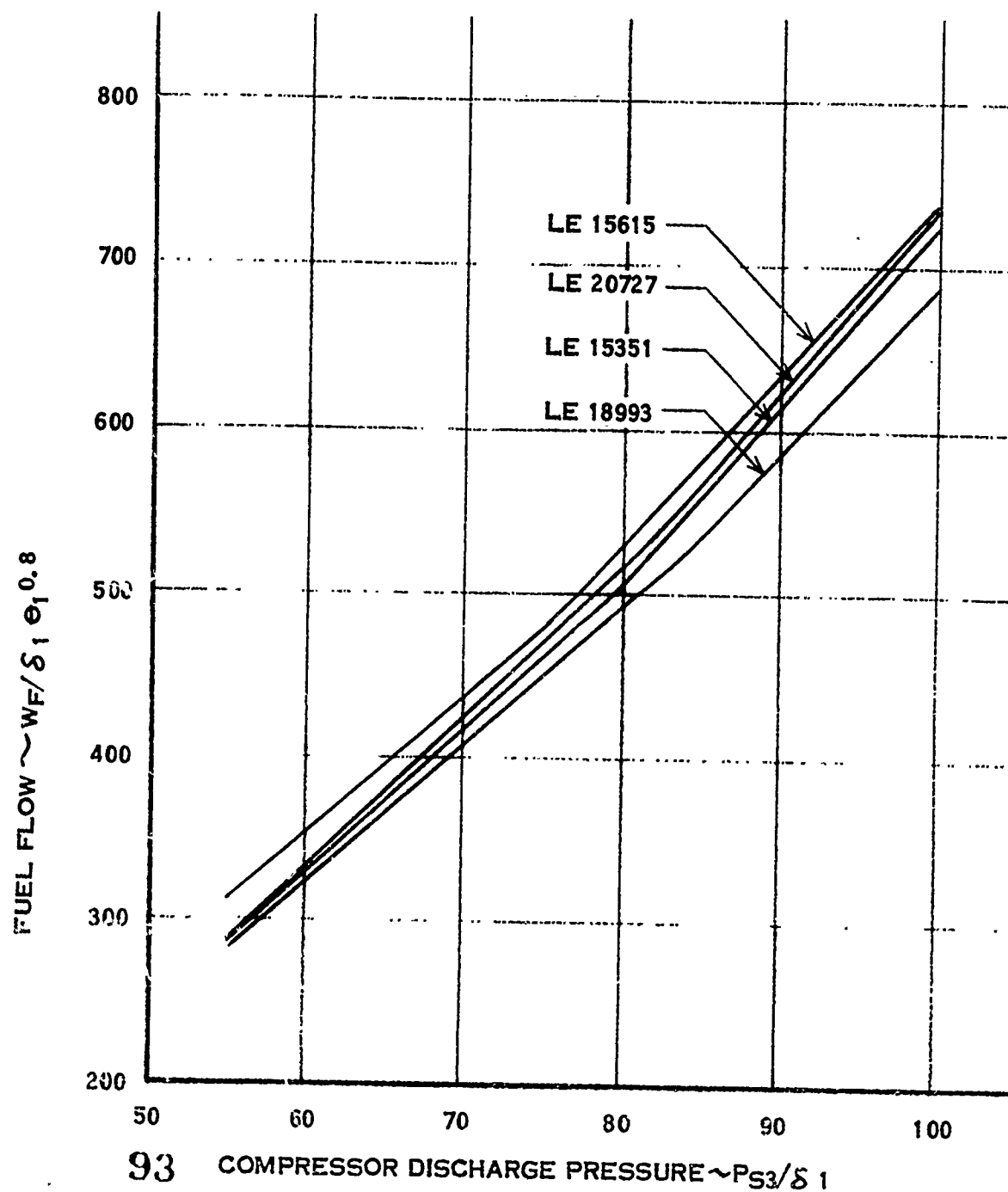


FIGURE 5-15 SHAFT HORSEPOWER BASELINES FOR FLIGHT TEST ENGINES

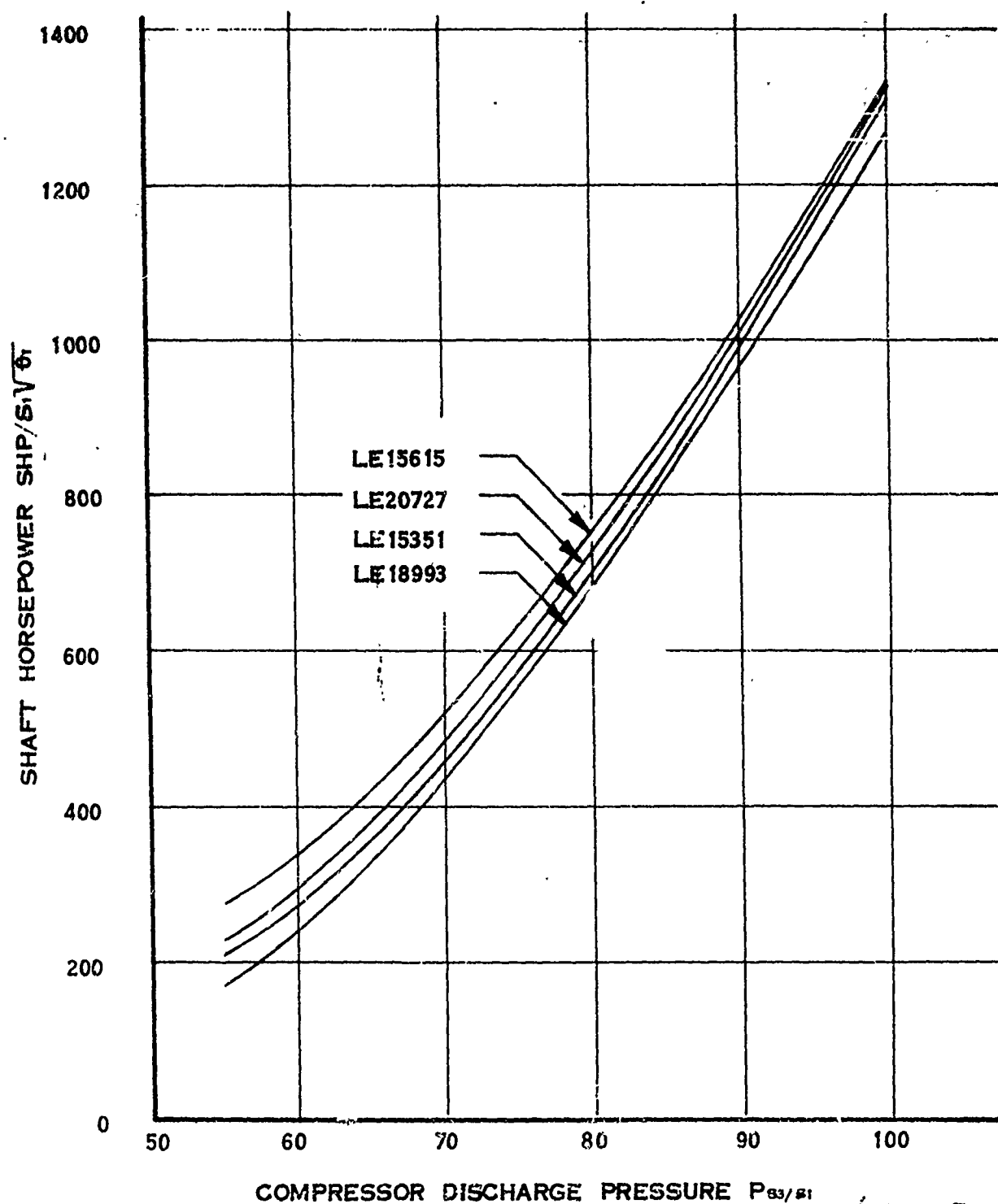


FIGURE 5-16 EXHAUST GAS TEMPERATURE BASELINES FOR FLIGHT TEST ENGINES

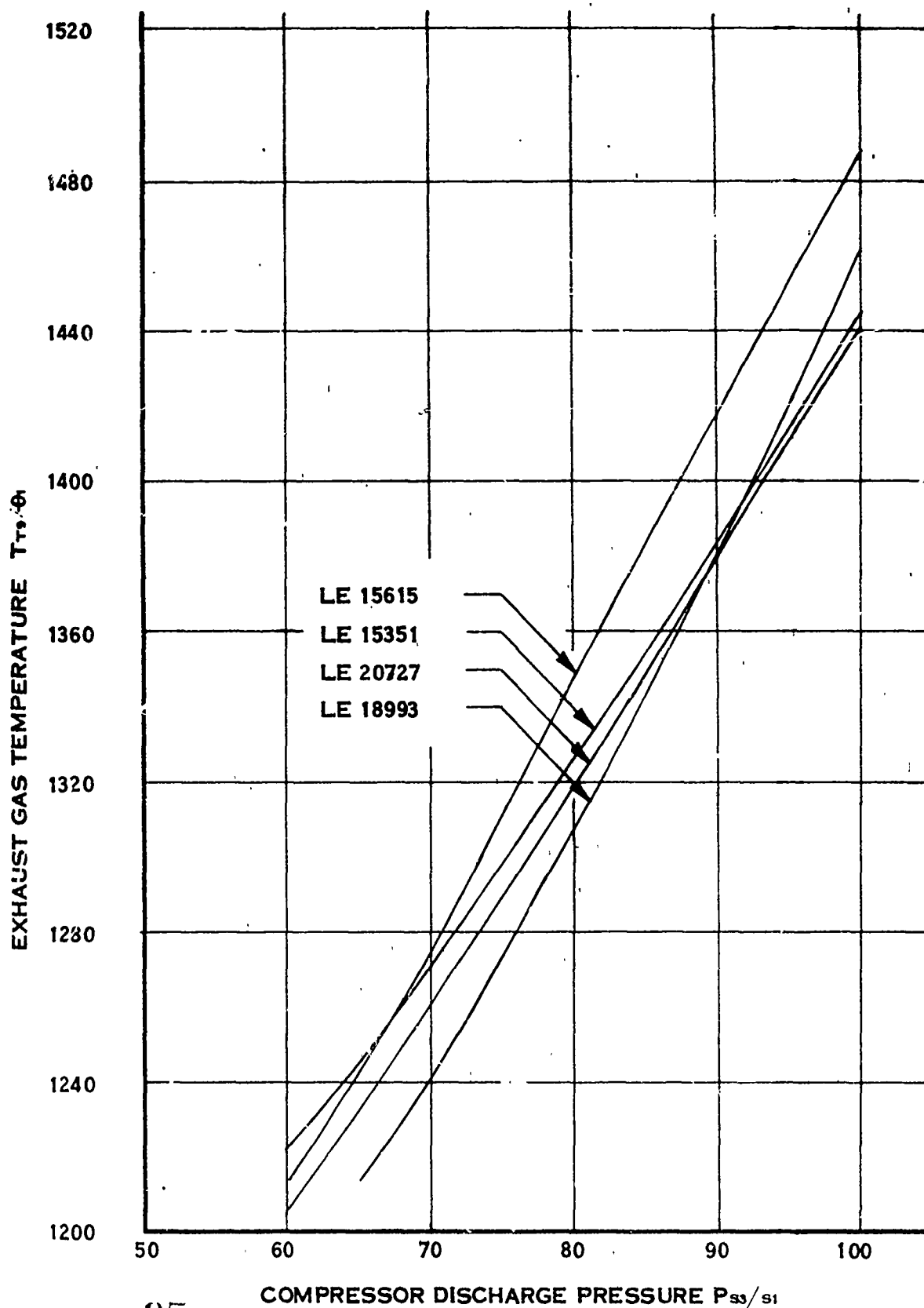


FIGURE 5-17 GAS PRODUCER SPEED BASELINE FOR VERIFICATION ENGINES

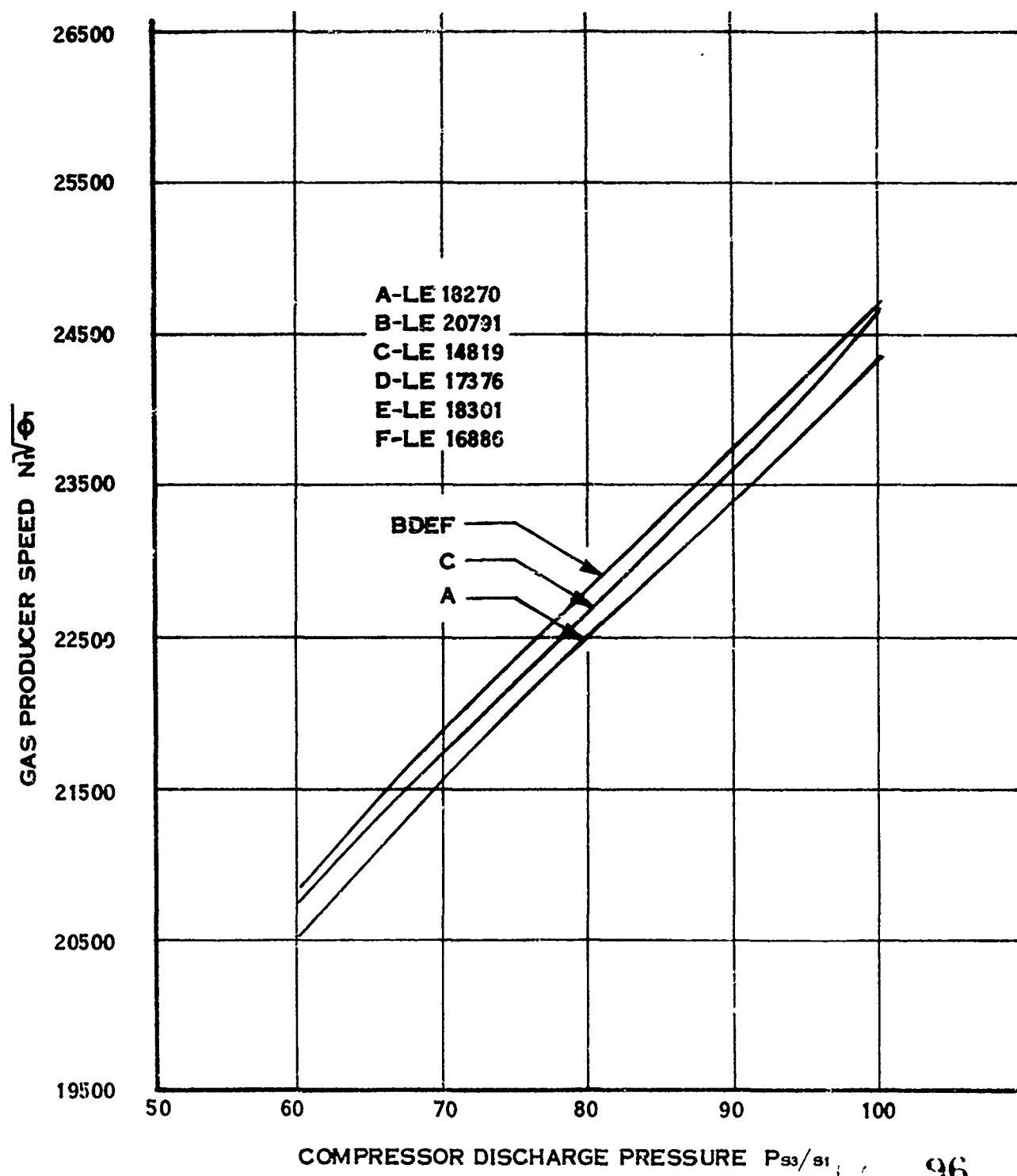


FIGURE 5-13 COMPRESSOR TEMPERATURE BASELINES FOR VERIFICATION ENGINES

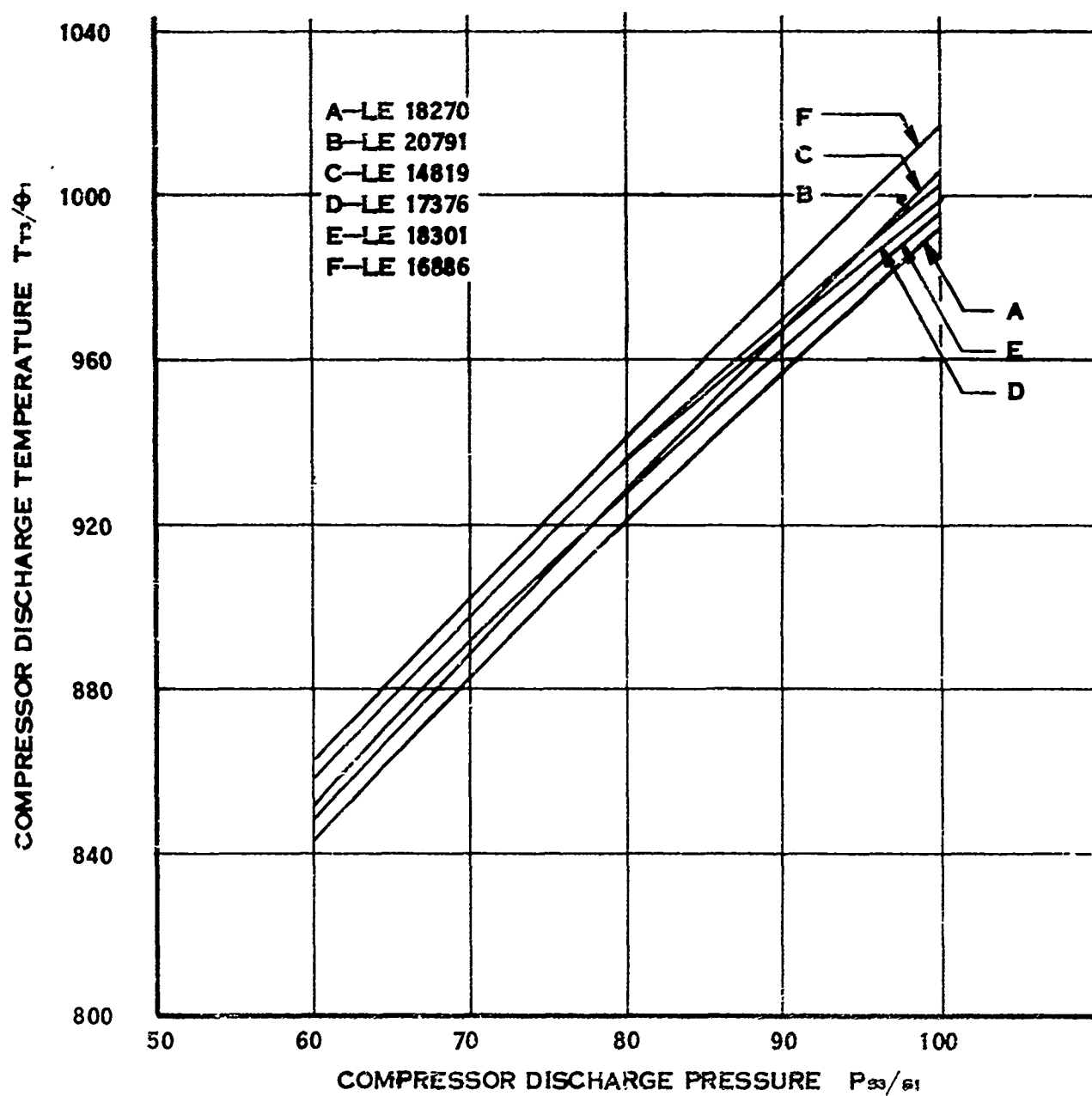


FIGURE 5-19 FUEL FLOW BASELINES FOR VERIFICATION ENGINES

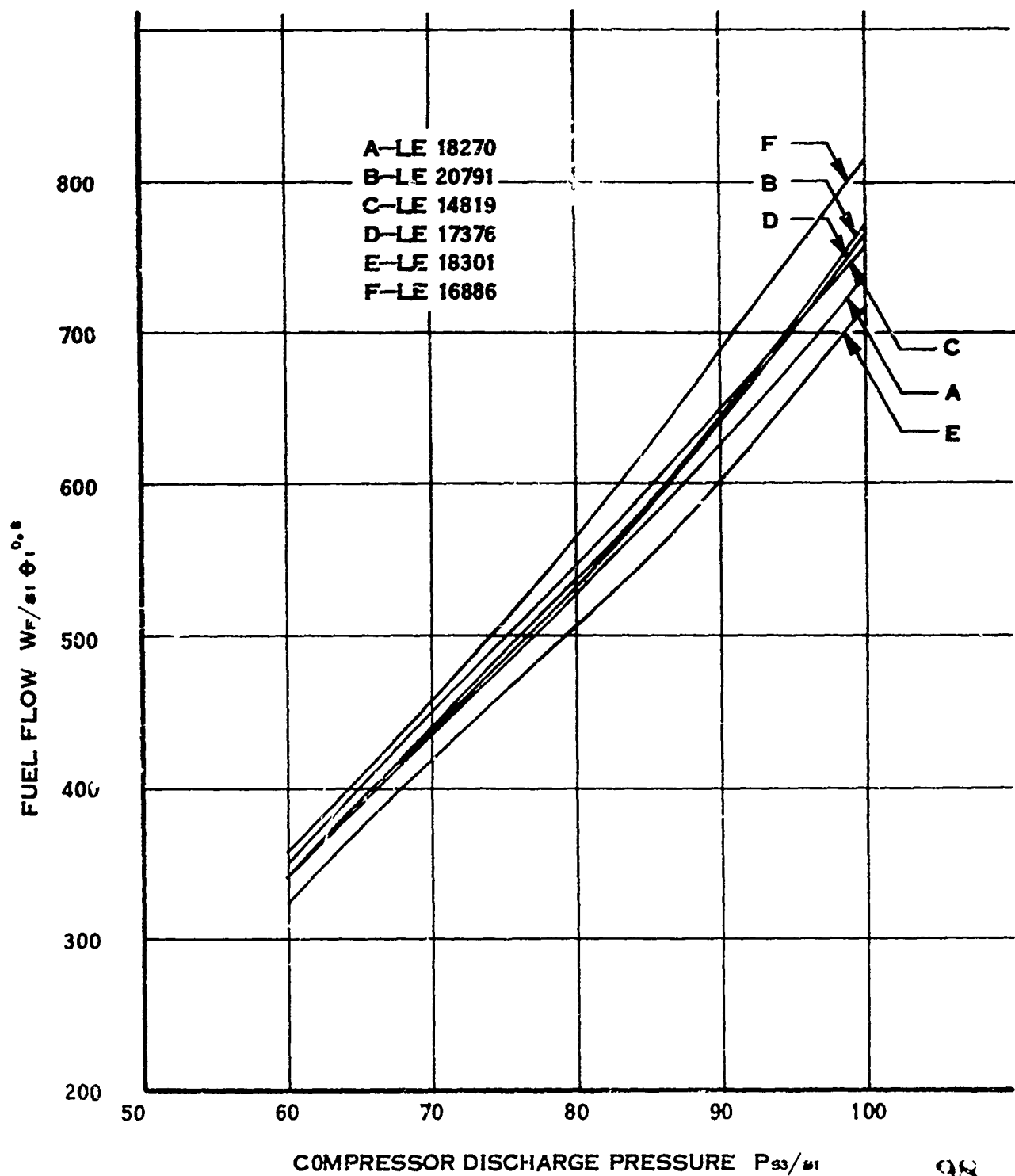




FIGURE 5-20 SHAFT HORSEPOWER BASELINES  
FOR VERIFICATION ENGINES

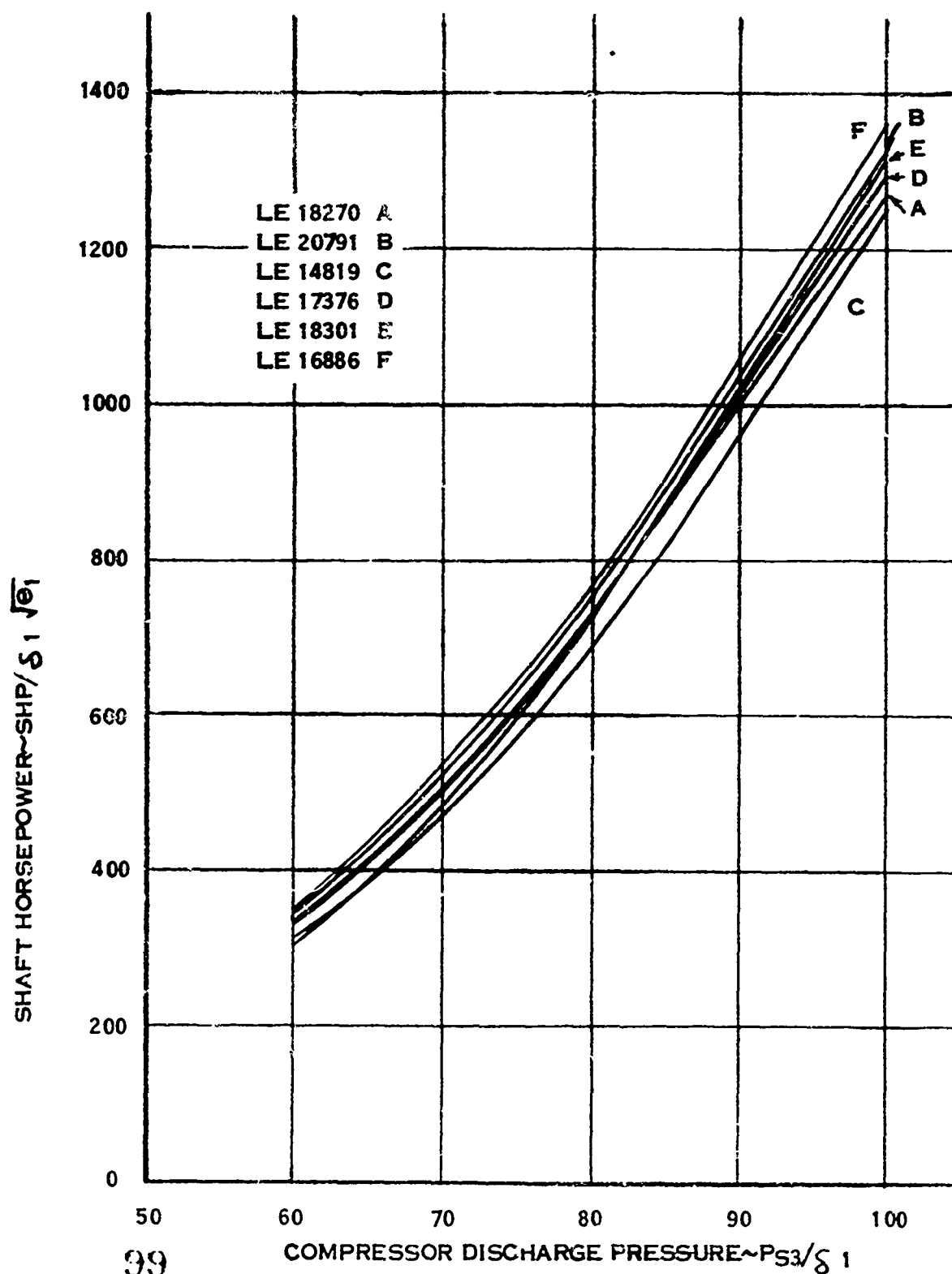


FIGURE 21 EXHAUST GAS TEMPERATURE  
BASELINES FOR VERIFICATION ENGINES

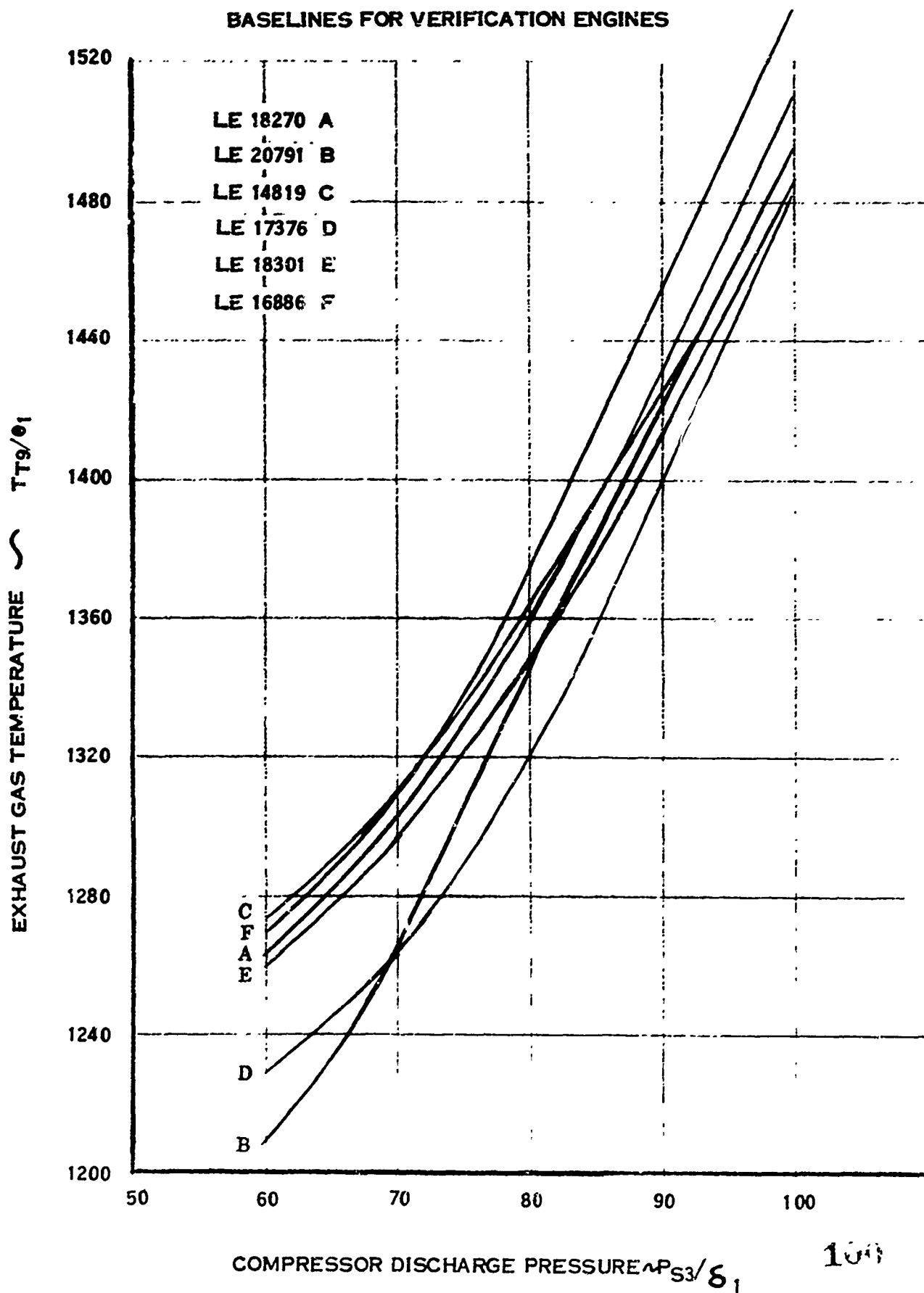


FIGURE 5-22 AIDAPS BASELINE VARIATION ANALYSIS

ANALYSIS APPROACH	$\Delta N_1$	$\Delta T_{T3}$	$\Delta W_F$	$\Delta SHP$	$\Delta T_{T9}$	$\Delta T_{T5}$	$\Delta W_A$	$\Delta \eta_C$	$\Delta A_5$	$\Delta \eta_T$	$\Delta A_N$
I	$\pm 0.22$	$\pm 0.54$	$\pm 3.68$	$\pm 4.67$	$\pm 1.43$	$\pm 1.69$	$\pm 6.13$	$\pm 1.24$	$\pm 5.38$	$\pm 2.09$	$\pm 6.00$
II	$\pm 0.71$	$\pm 0.96$	$\pm 5.33$	$\pm 5.60$	$\pm 2.02$	$\pm 2.36$	$\pm 9.04$	$\pm 2.24$	$\pm 7.71$	$\pm 3.13$	$\pm 8.25$
III	$\pm 0.89$	$\pm 1.28$	$\pm 4.59$	$\pm 5.33$	$\pm 3.00$	$\pm 3.21$	$\pm 9.82$	$\pm 2.99$	$\pm 7.90$	$\pm 4.42$	$\pm 8.18$

(CALCULATED ON ROOT-SUM-SQUARE BASIS.)

APPROACH	BASELINE DATA FROM
I	PHASE D ENGINES
II	DEMONSTRATION ENGINES
III	NOMINAL ENGINE BAND

FIGURE 5-23 AIDAPS FLIGHT PROFILE

1. 3 MINUTE HOVER: AMBIENT PRESSURE \_\_\_\_\_  
AMBIENT TEMPERATURE \_\_\_\_\_
2. MAINTAIN CONSTANT I.A.S. AND ALTITUDE DURING RUNS AT 100 N<sub>2</sub>

%N <sub>ic</sub>	TIME (MIN)	TEMP (°C)	N <sub>1</sub> (% IND)	IAS (KNOTS)	ALT (FT)	TORQUE (PSI)
83 TO 87	5					
87 TO 91	10					
91 TO 95	10					
95 TO 100	5					

3. VIBRATION DATA PROFILE:

TIME OF DAY	MANEUVER	N <sub>1</sub>	TORQUE (PSI)	ALT (FT)	IAS (KNOTS)
	GROUND RUN (FULL POWER) HOVER NORMAL CLIMB (500 FPM/80 KTS) LOW POWER LEVEL FLIGHT (75 KTS) MEDIUM POWER LEVEL FLIGHT (95 KTS) HIGH POWER LEVEL FLIGHT (115 KTS) NORMAL DESCENT (500 FPM/80 KTS)				

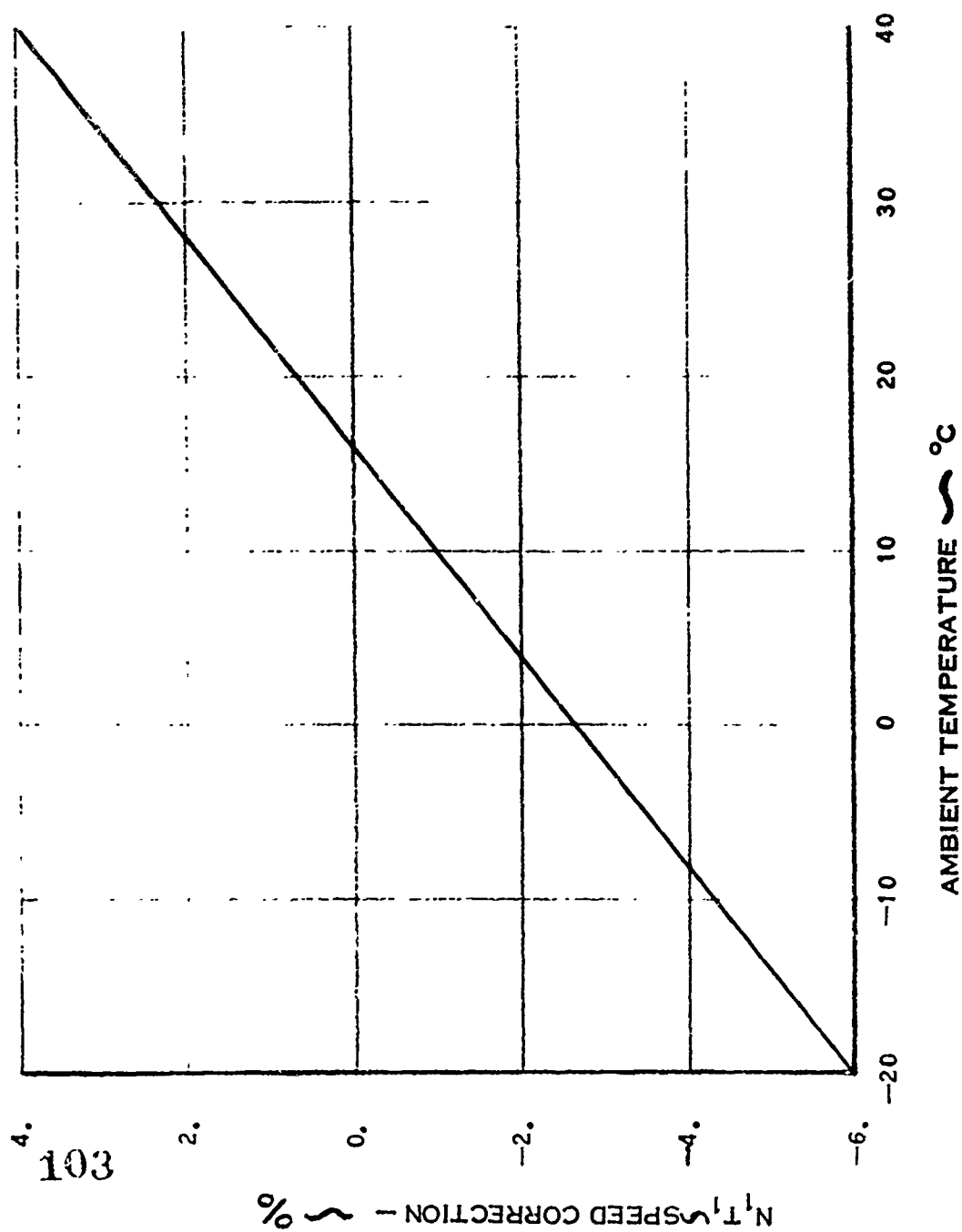
4. REPEAT VIBRATION PROFILE 3 ABOVE.
5. REPEAT PROFILE 2 ABOVE.

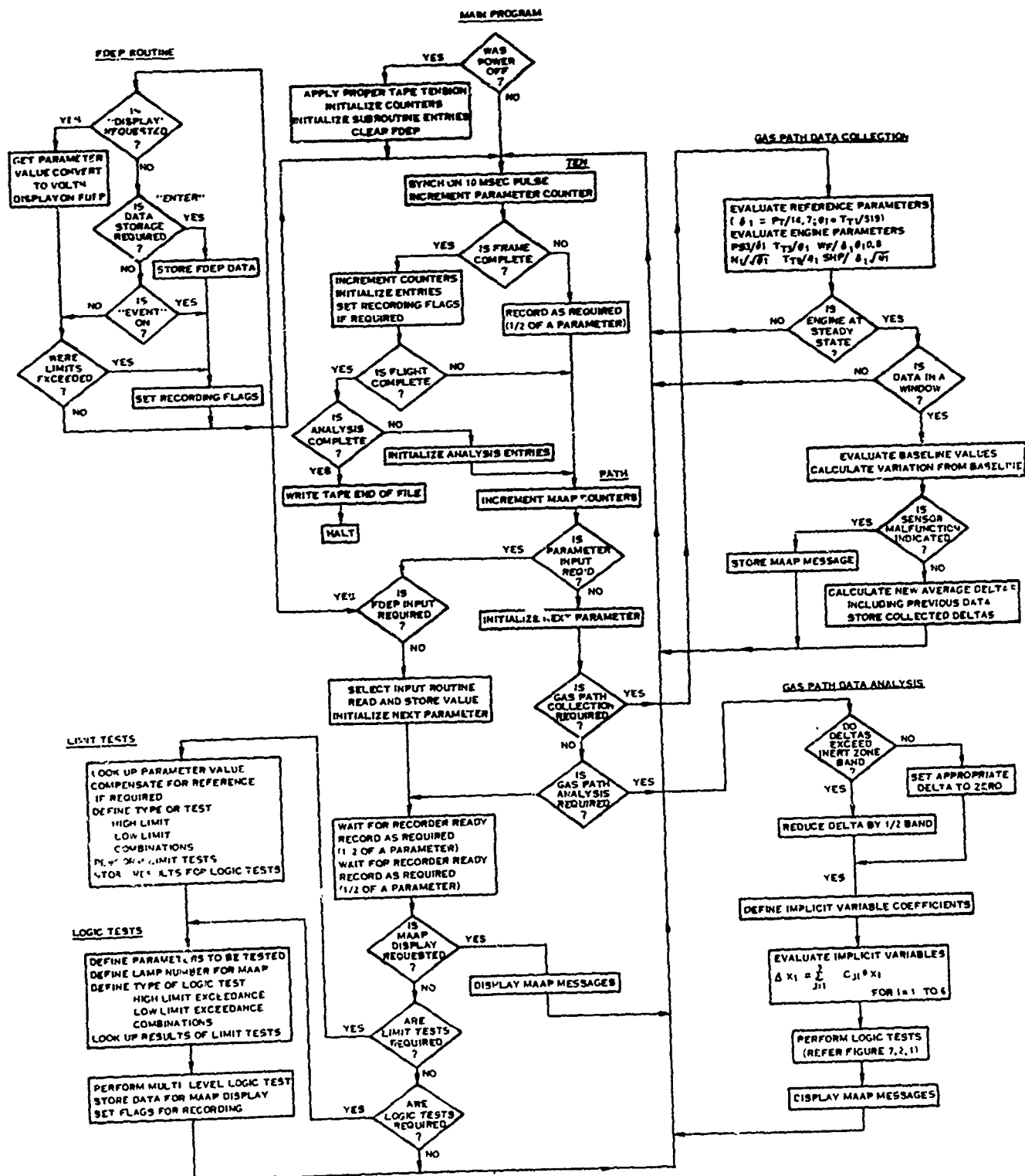
NOTES

1. BLANKS TO BE COMPLETED BY CREW DURING FLIGHT.
2. CALCULATE %N<sub>ic</sub> AS FOLLOWS.  

$$\%N_{ic} = \%N_1 \text{ IND} + N_1 T_1 \text{ FROM ATTACHED CURVE}$$

FIGURE 5-23 (CONTINUED)  
AMBIENT TEMPERATURE CORRECTION TO INDICATED  $N_1$  RPM





**FIGURE 3-24 AIDAPS AIRBORNE PROGRAM FLOW DIAGRAM**

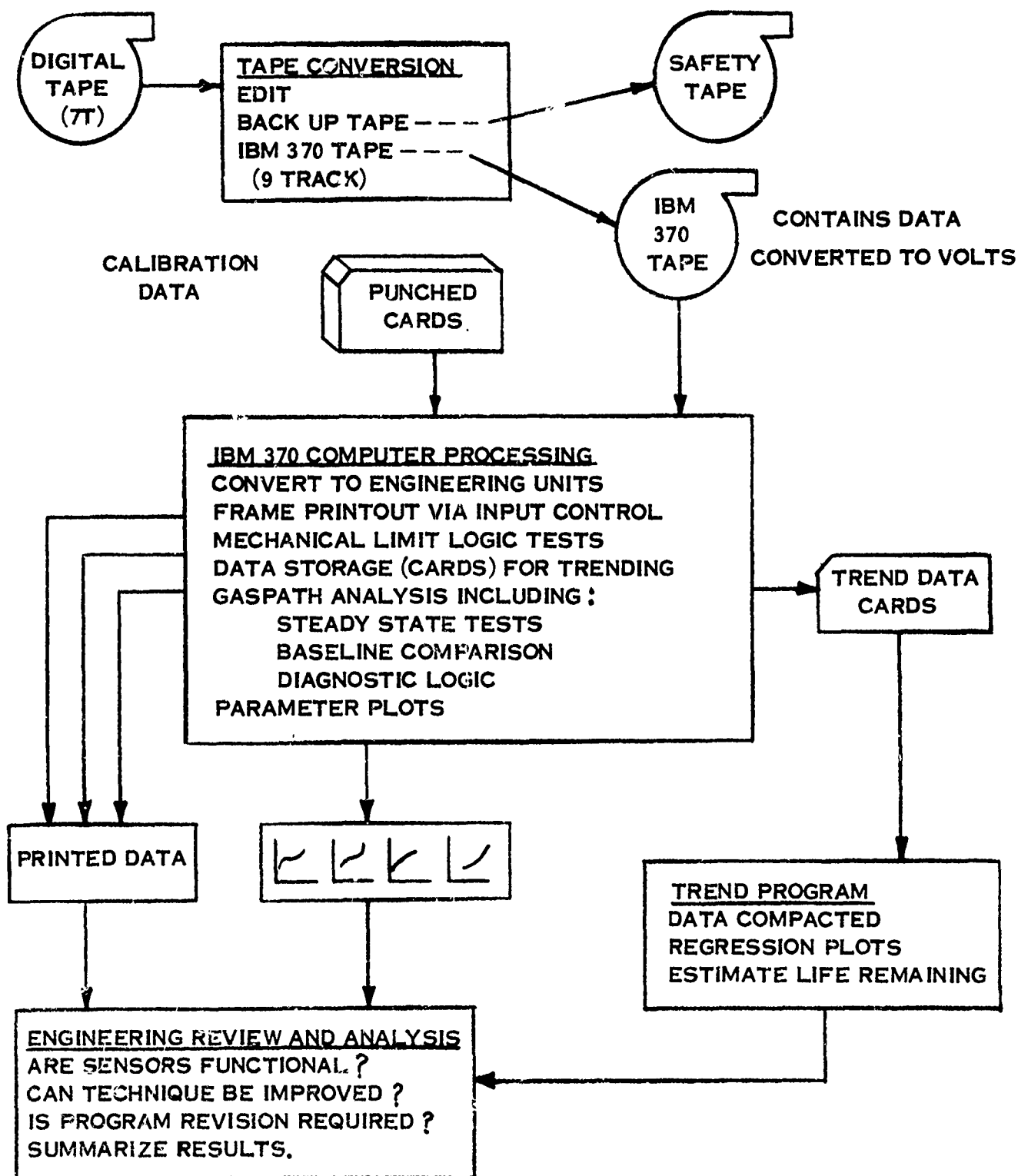
## AIDAPS ON-SITE DATA REVIEW LISTING

## AIDAPS RECORD NUMBER 000731 STANDARD RECORD

TIME	03283				
SYNCH	01021	01021	01021	01021	FRAME IDENTIFIERS
N1	092.21	092.21	092.21	092.34	
N2	100.33	100.49	100.16	100.33	
NP	101.99	102.50	101.99	102.16	
PS3	066.64	066.49	066.84	066.94	
TT3	0439.6	0437.5	0439.9	0442.3	
EGT	0874.8	0872.4	0875.7	0869.2	
TT9	0910.5	0900.7	0891.8	0954.2	RING PATTERN
	0912.9	0944.5	0917.7	0921.0	
	0910.5	0973.6	0933.9	0943.6	
WF	0544.4	0526.5	0540.7	0529.5	
02	0368.6	0380.6	0366.2	0383.0	
PEF	25.951	26.143	25.983	26.143	Q2 SENSOR REFERENCE
PT PS	13.654	13.654	13.063		
P1	13.154				
TT1	082.53	082.61			
DCJSG	-04.461	02.544			
LRIFT	-04.526	-03.581	-04.551	-04.531	COMPUTER HEALTH
OCH	08.384	08.384			
PP WF	0.1647	0.1186			
F TOP	082.20	082.08	049.09	048.57	2 EOP/2 TOP
PEF	26.015	26.111	26.047	25.887	OIL SENSOR REFERENCE
HSP	0990.0	1055.4	PRESSURE SEN		PRESSURE SENSOR REF.
REF	10.025	10.141			B2DT/B3DT
B2 3T	245.06	233.72			
G4 9T	047.88	001.80			G42DT/G90DT
HT FT	095.89	064.69			HST/T FUEL
HP DT	034.70	039.41			
H TOT	100.19	100.00	115.88	116.85	2 EOT/2 TOT
ACEB	113.48				
ACIB	26.108				
DC SB	27.952	26.427			DCEB/SBV
DG 4	01021.	00959.	00126.		PACKED SWITCHES
7 11	01021.	00959.	00126.		
PLA S	00.054	00.054	00.054	00.054	
PLA C	-04.196	-04.196	-04.191	-04.206	
LGV S	00.844	00.844	00.819	00.829	SINE $\theta$
LGV C	-04.081	-04.076	-04.006	-04.096	COSINE $\theta$
HP S	01.404	01.349	01.389	01.384	
FP C	03.984	04.004	03.989	03.994	
CPA S	01.194	01.189	01.184	01.199	
CPA C	-04.041	-04.041	-04.041	-04.051	

FIGURE 5-26

AIDAPS REMOTE GROUND ANALYSIS





# TYPICAL FRAME DATA

N1 RPM	W FUEL	PS3	TT9	1	931.64	TT1	DUJC	-4.475	ENT	90.00	HYD SUP	P	761.04	OIL FLOW	3596.11
23685.86	628.71	73.88	943.38	2	981.56	57.67	CJC	-4.440	90.00				431.86		3623.77
23721.09	550.75	73.88	944.24	3	959.68	57.62	DRFT	-3.585	121.00	HYD SUP	Y		122.38	HYD FLOW	0.114
23721.89	539.90	73.83	946.79	4	902.17		SGRF	9.980	121.00	FUEL TEMP			62.04		0.639
23650.71	559.18	73.93	949.34	5	1021.74	PT	ACER	112.79	EUP	93.39	ARG 2	DT	53.48	PUMP NT	38.47
				6	911.08	11.88	ACIR	26.00	TOP	92.63	ARG 3+4	DT	154.42		35.35
			TORQUE	7	891.64	11.87	UCE9	26.78	TOP	55.53	42 GNOX	DT	48.51	DCDRFT	-4.52
		TT3		8	987.65		SBV	26.98	CPA	56.30	90 GNOX	DT	38.22		-4.52
	514.13			9	973.85	PS/PS1	PLA	98.31		61.98			93.55	FUEL PRES	21.46
	514.72			10	1084.33	11.49		98.32		61.92			93.85		21.81
	511.77			11	907.03	11.09		98.74		61.92			93.85		23.01
	514.43			12	971.84			98.60		61.88			94.12		21.57
N2 RPM	NR RPM	TT3	TORQUE	7	891.64	11.87	UCE9	26.78	TOP	55.53	42 GNOX	DT	48.51	DCDRFT	-4.52
6544.45	327.36	514.13	678.53	8	987.65		SBV	26.98	CPA	56.30	90 GNOX	DT	38.22		-4.52
6544.45	326.85	514.72	684.27	9	973.85	PS/PS1	PLA	98.31		61.98			93.55	FUEL PRES	21.46
6544.45	327.36	511.77	676.50	10	1084.33	11.49		98.32		61.92			93.85		21.81
6544.45	327.88	514.43	671.15	11	907.03	11.09		98.74		61.92			93.85		23.01
6544.45				12	971.84			98.60		61.88			94.12		21.57

HSER 6080									
Volume II									
AVERAGED DATA									
TIME	AVF	FL	TT	N1	PS	TT	TORQUE	PUMP IN	TOT
945.0187		520.004	513.7646	23712.3750	PS	73.8804	677.6113	36.9093	121.0000
	N2	ERR	HSP	NR	OCF	PT	EQ	TNP	P9 FLW
6544.4531		43.0104	596.4541	327.3630	3600.9316	11.8762	90.0000	55.9187	0.3768
CORRECTED DATA									
TT3C		PS3C	N1C	N2C	WFC	TT9CR	Q2C	TT9C	SHPC
975.3140		91.4477	23744.0039	4553.1797	669.6940	1409.6919	838.7295	1403.8445	1071.9453
CORRECTED FILTERED DATA									
TT3C		PS3C	N1C	N2C	WFC	TT9CR	Q2C	TT9C	SHPC
975.3140		91.4477	23744.0039	4553.1797	669.6940	1409.6919	838.7295	1403.8445	1071.9453
CORRECTED TTY PATTERN									
1395.355		1445.405	1423.474	1365.806	1485.696	1374.740	1355.247	1437.677	1548.450
							1451.513		1435.657

FIGURE 5-27 TYPICAL FRAME DATA  
RECORD 205 ON 7/30/71

FIGURE 5-27 TYPICAL FRAME DATA  
RECORD 205 ON 7/30/71

RECORD NO FILE 1 34 MINUTES, 40 SECONDS FROM START OF FLIGHT

11 (LE 18301) 5TH UNKNOWN 215

N1 RPM	W FUEL	P53	TT1	1	931.64	TT1	DCJC	-4.475	EGT	0.00	HYD SUP P	734.71	OIL FLOW	3623.75
2322.45	534.66	73.88	945.14	3	980.15	57.54	CJC	-4.430	TOT	90.00	HYD SUP T	573.51	HYD FLOW	3651.83
23615.69	542.57	73.99	944.24	3	959.87	57.62	CRFT	-3.545	TOT	121.00	FUEL TEMP	59.33		0.127
23085.40	537.26	73.93	945.42	4	972.17		CRFL	3.960	FOP	94.12	GRG 2 DT	63.17	PUMP DT	35.63
23721.09	546.74	73.99	949.34	5	1023.36	PT	PCF8	112.53	FOP	93.95	BKG 3+4 DT	153.52		41.36
				5	911.45	11.4P	ACFR	26.00	TOP	57.22	42 GROX DT	42.54	DCORFT	-4.52
N2 RPM	NK RPM	TT3	TORQUE	7	991.64	11.4P	PCF4	26.71	TOP	55.60	90 GROX DT	33.08	FUEL PRES	21.65
4545.45	327.48	513.54	676.01	8	938.66	PS/PS1	PLA	94.45	CPA	61.98	IGV	93.83		22.04
6545.45	327.48	510.59	659.66	9	974.67	11.49		98.59		61.94		93.83		22.34
6545.45	326.13	514.43	675.53	10	1083.52	11.49		98.45		62.11				
6545.45	327.36	513.84	675.03	11	999.65									
				12	974.27									

	SLOT 1		SLOT 2		MALFUNCTION		SLOT 1		SLOT 2		MALFUNCTION	
	1	1	1	1	1	1	1	1	1	1	1	
ACC. GEARBOX CHIP												
NO. 2 BEARING CHIP												
42 DEGREE GEARBOX CHIP												
OVERSPEED GOV. SWITCH POSITION												
RPM WARNING LIGHT												
RIGHT FUEL PUMP FLOW												
HYD. PRESSURE												
TRANSMISSION OIL TEMPERATURE												
IGNITION EXCITER												
ENG. DRIVER FUEL PUMP PRESSURE												
FUEL OIL FILTER DP												
NO. 2 BEARING PRESSURE												
TRANS. INT. OIL FILTER DP												
BLEED BAND POSITION												

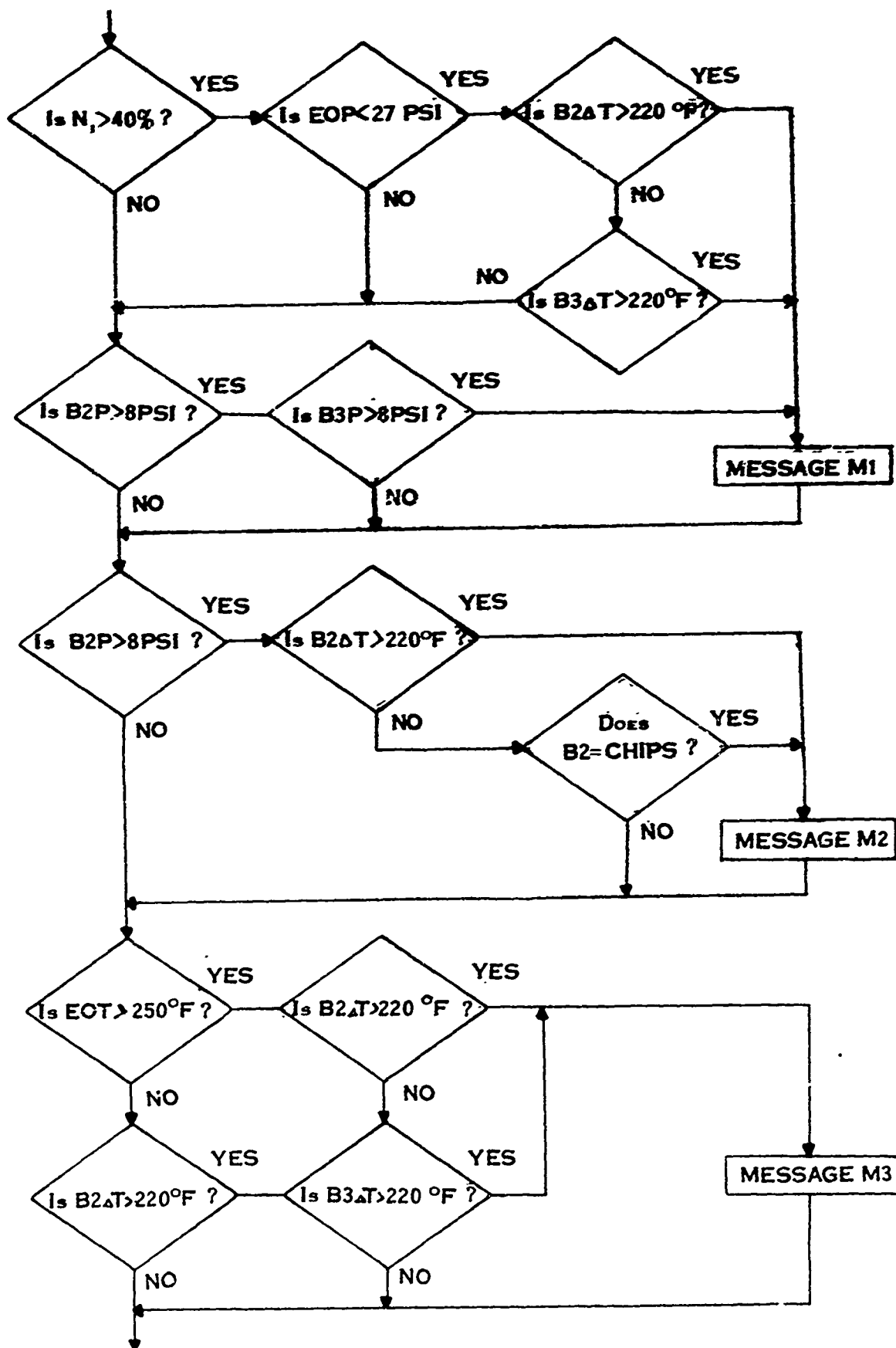
AVERAGED DATA									
EGT AVER	FUEL FLOW	TT1	TT3	PS3	PT	TORQUE	PUMP DT	TOT	
745.3665	534.6154	513.0999	3712.5156	73.9465	57.5774	671.7078	38.4985	121.0000	
N2	ERP	WSP	NK	WCF	PT	ENT	TNP	PB FLOW	
6545.4531	94.0377	454.1128	327.3638	3637.7871	11.4841	90.0000	56.9049	0.1594	
TT1C	PS3C	NIC	N2C	WFC	TT9CP	Q2C	TT9C	SMPC	
745.7744	91.4777	23745.0820	4553.4375	662.7727	1410.2300	930.8650	1404.3867	1061.9119	
TT3C	PS3C	NIC	N2C	WFC	TT9CP	Q2C	TT9C	SMPC	
745.7744	91.4777	23745.0820	4553.4375	662.7727	1410.2300	930.8650	1404.3867	1061.9119	
CO-ECTED TT4 PATTERN									
1345.465	1444.736	1422.774	1345.914	1487.441	1375.661	1452.441	1438.034	1547.763	1438.208

FIGURE 5-28 TYPICAL FRAME DATA  
RECORD 206 ON 7/30/71



## AIDAPS MECHANICAL DIAGNOSTIC LOGIC

IN TABLE 5-1"



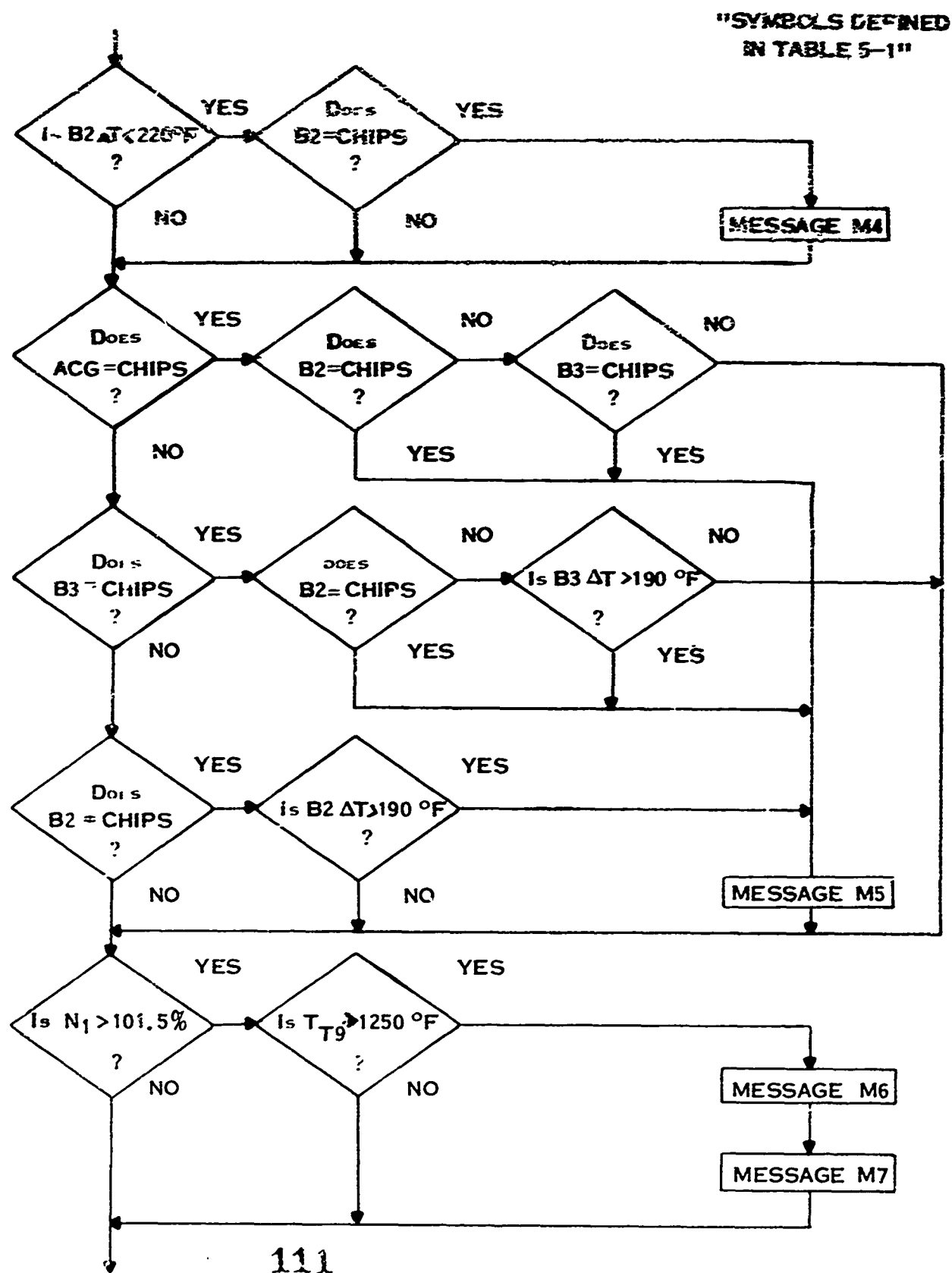
SSER 6050  
Volume II

FIGURE 5-32

HSER 6080

Volume II

AIDAPS MECHANICAL DIAGNOSTIC LOGIC

"SYMBOLS DEFINED  
IN TABLE 5-1"

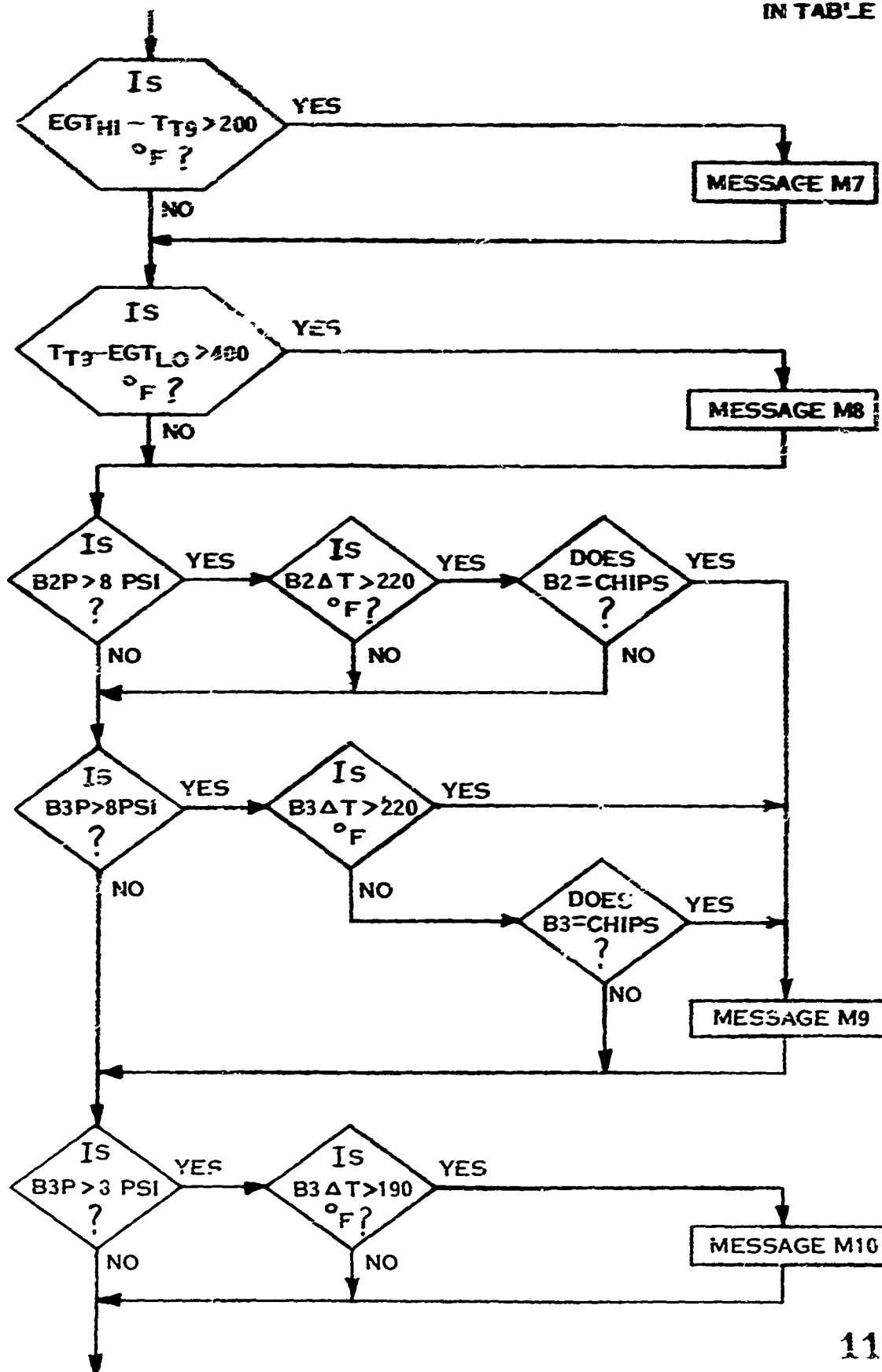


FIGURE 5-33

AIDAPS MECHANICAL DIAGNOSTIC LOGIC

"SYMBOLS DEFINED  
IN TABLE 5-1"

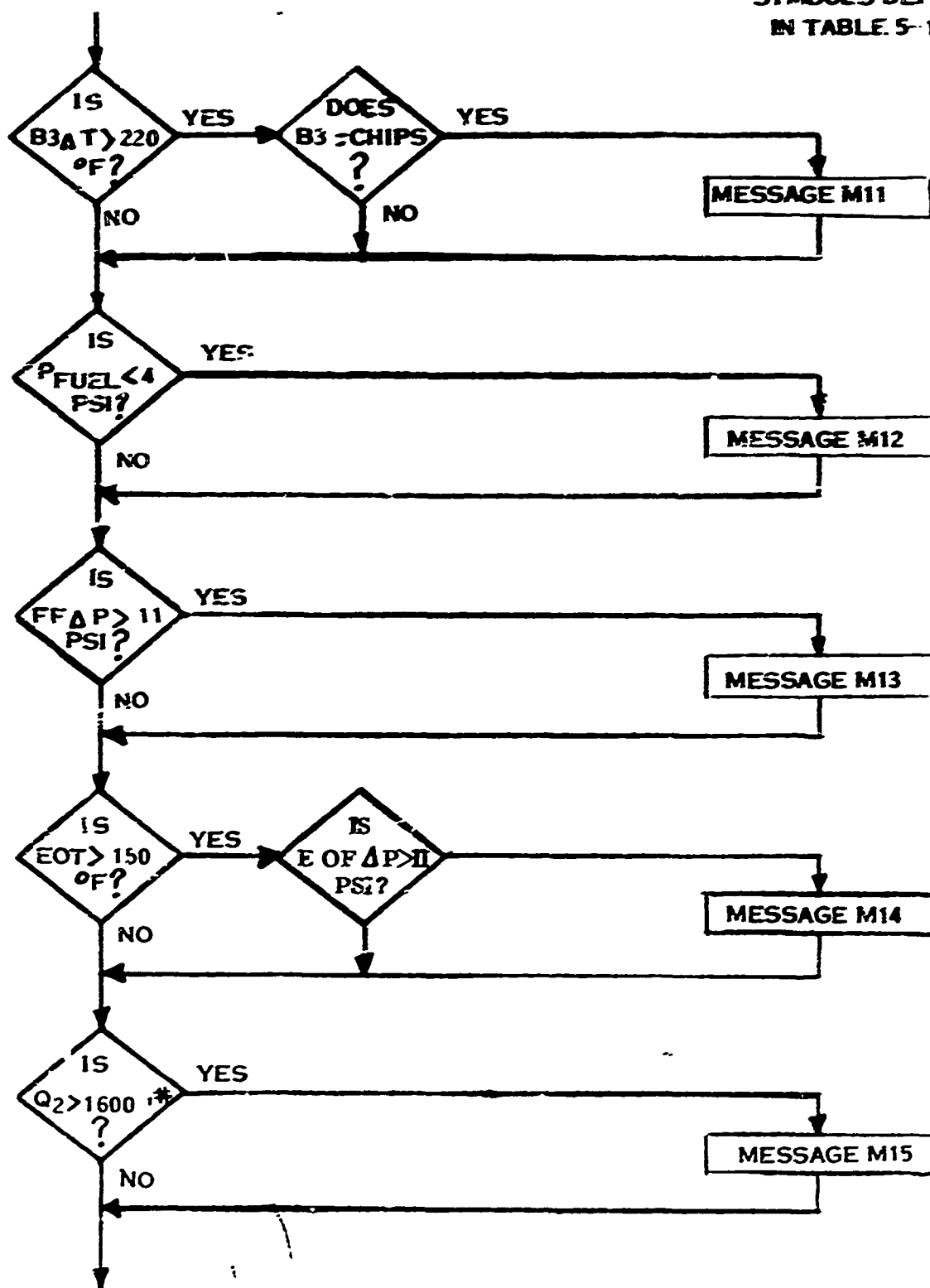


FIGURE 5.4  
AIDAPS MECHANICAL DIAGNOSTIC LOGIC

"SYMBOLS DEFINED  
IN TABLE 5-1"

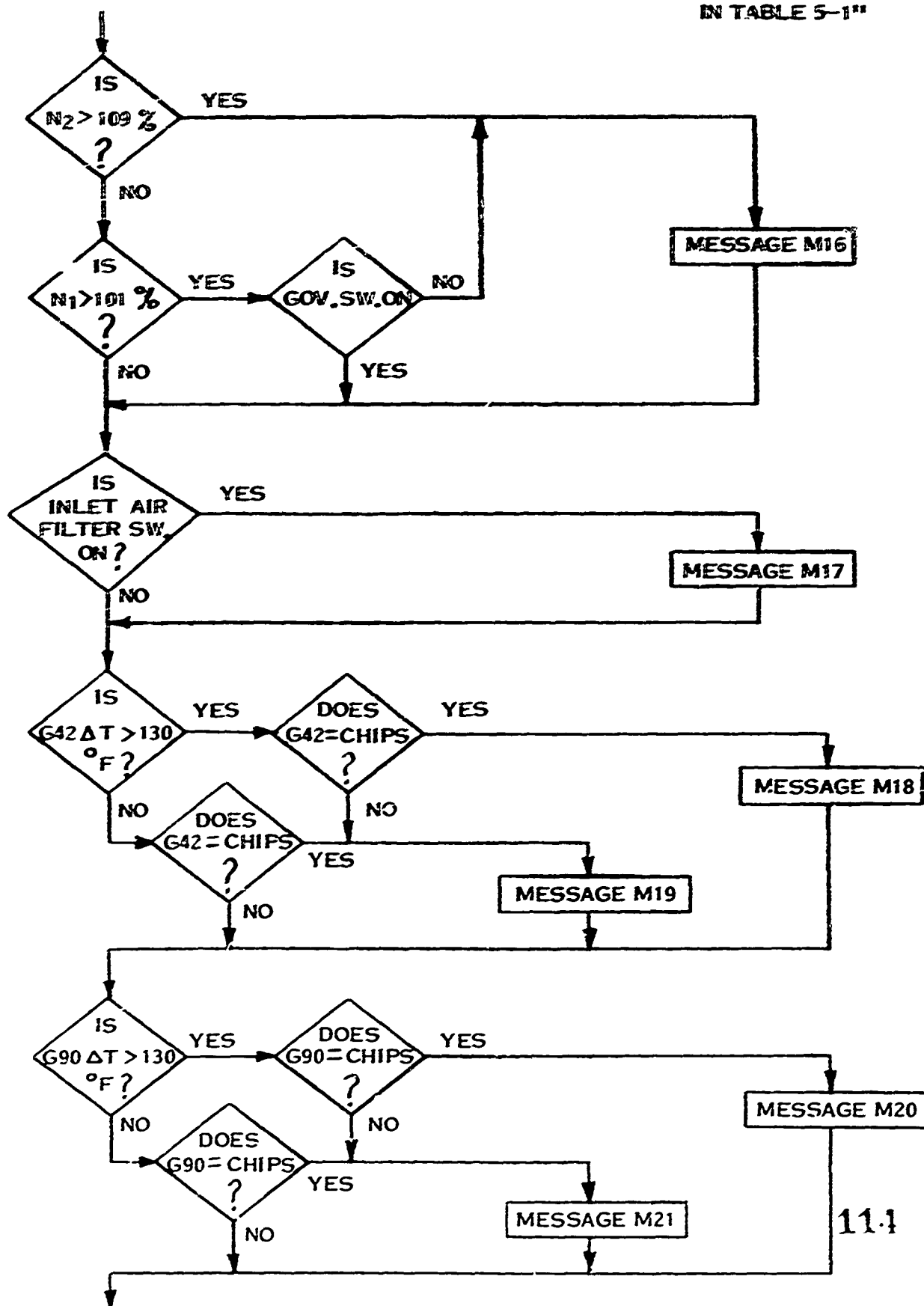
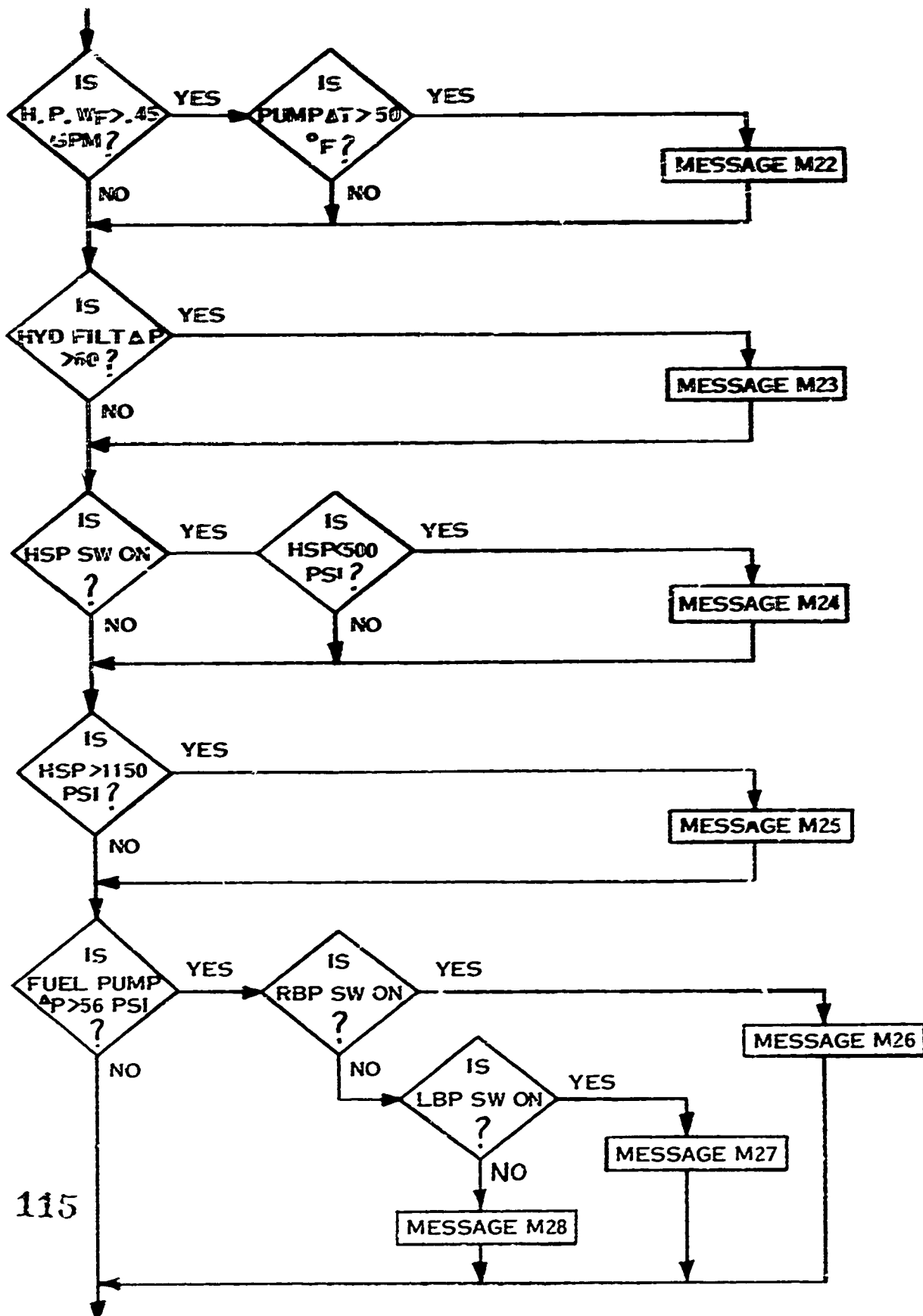




FIGURE 5-35

AIDAPS MECHANICAL DIAGNOSTIC LOGIC

"SYMBOLS DEFINED  
IN TABLE 5-1"



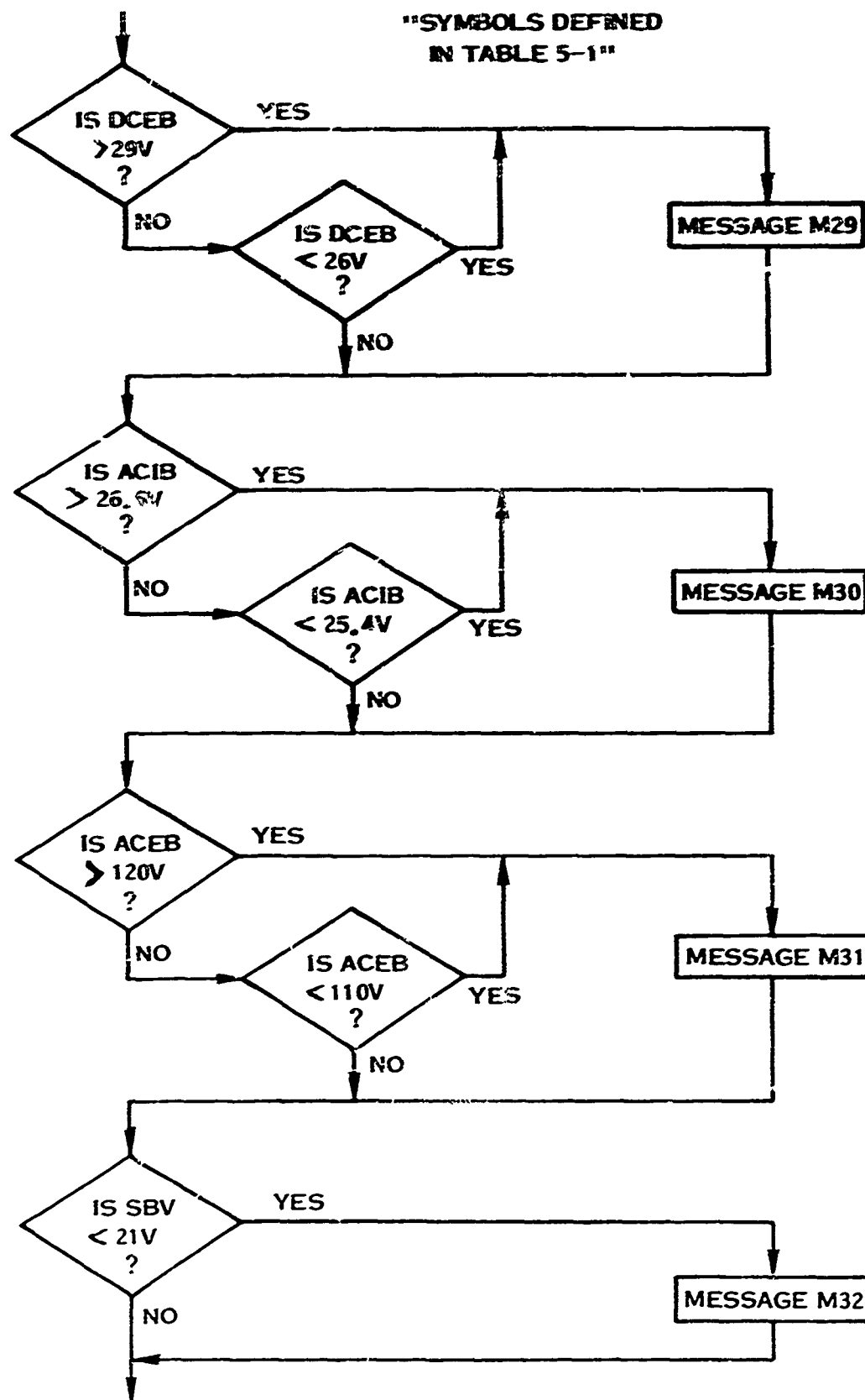


FIGURE 5-36 AIDAPS MECHANICAL DIAGNOSTIC LOGIC

"SYMBOLS DEFINED  
IN TABLE 5-1"

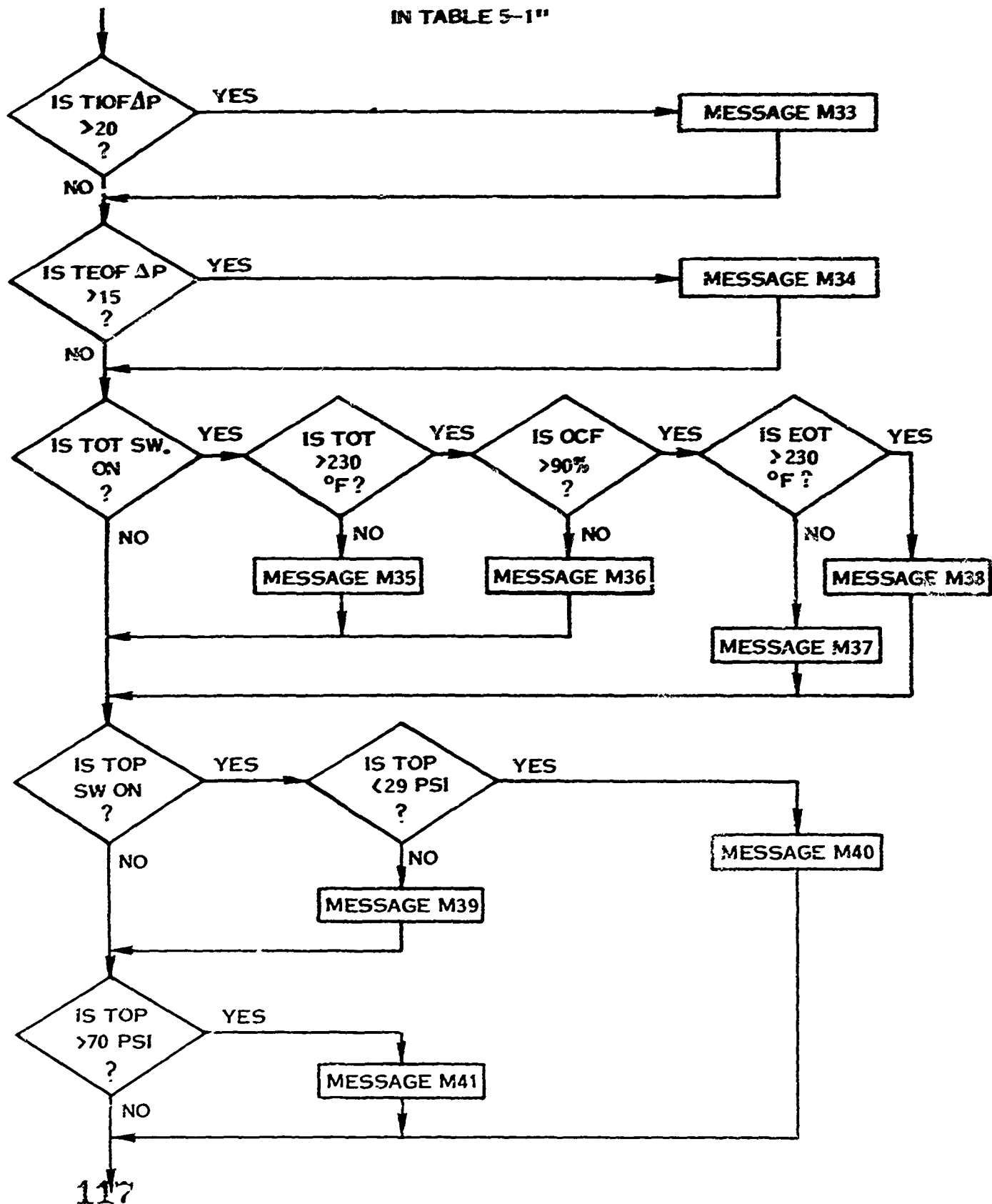
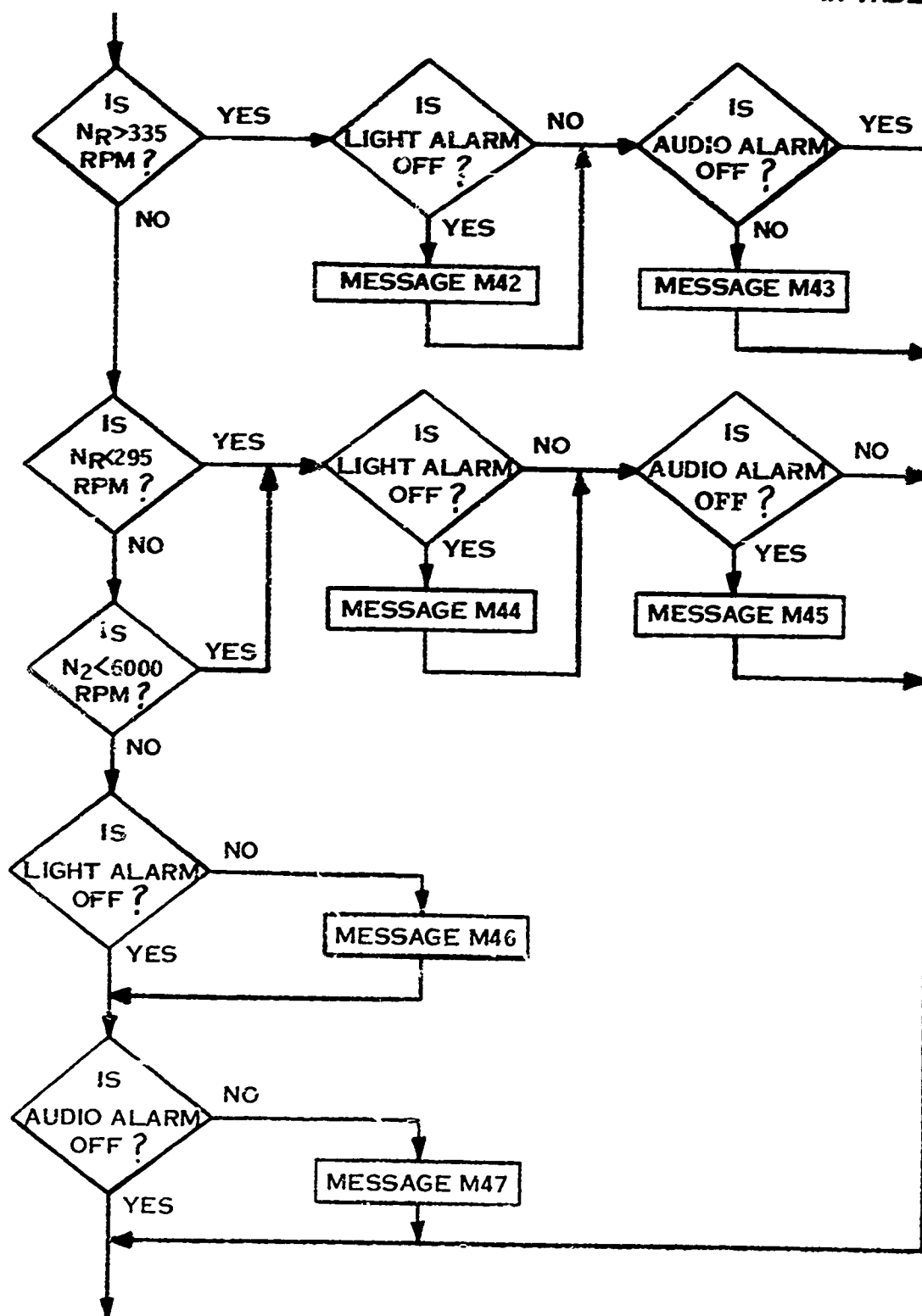


FIGURE 5-37 AIDAPS MECHANICAL DIAGNOSTIC LOGIC

FIGURE 5-38  
AIDAPS MECHANICAL DIAGNOSTIC LOGIC

"SYMBOLS DEFINED  
IN TABLE 5-1"



END OF MECHANICAL LOGIC.

**FIGURE 5-39**     AIDAPS Maintenance Action Messages  
                         Mechanical Diagnostic Actions

- M1     Adjust Oil Pump Pressure
- M2     Inspect Compressor Rear Bearing Seal
- M3     Inspect Lubrication System
- M4     Inspect Bearing 2 Oil Strainer
- M5     Perform Oil Contamination Inspection
- M6     Perform N<sub>1</sub> Topping Check
- M7     Perform Internal (Hot End) Inspection
- M8     Replace EGT Harness
- M9     Replace Combustor/Turbine Assembly
- M10    Inspect Power Turbine Rotor Assembly
- M11    Inspect Bearing 3 and 4 Oil Strainer
- M12    Replace Faulty Fuel Pump
- M13    Replace Fuel Control Servo Filter
- M14    Clean Engine Oil Filter
- M15    Perform Overtorque Inspection
- M16    Perform Overspeed Inspection
- M17    Clean Inlet Air Filter
- M18    Replace 42 Degree Gearbox
- M19    Inspect 42 Degree Gearbox
- M20    Replace 90 Degree Gearbox
- M21    Inspect 90 Degree Gearbox
- M22    Replace Worn Hydraulic Pump
- M23    Clean Hydraulic Oil Filter
- M24    Hydraulic Supply Pressure Is Low. Improper Operation of Pressure Relief Valve,  
         Shutoff Valve or Broken Line.

FIGURE 5-39 (CONTINUED)

- M25 Hydraulic Supply Pressure Is High. Pressure Relief Valve Did Not Open or Pressure Control Is Inoperative.
- M26 Inspect Right Boost Fuel Pump and Pressure Switch.
- M27 Inspect Left Boost Fuel Pump and Pressure Switch.
- M28 Replace Fuel Pump Pressure Switch.
- M29 Malfunction of 28 VDC Essential Bus.
- M30 Malfunction of 26 VAC Instrument Bus.
- M31 Malfunction of 115 VAC Essential Bus.
- M32 Replace or Recharge Starting Battery.
- M33 Clean Transmission Internal Oil Filter.
- M34 Clean Transmission External Oil Filter.
- M35 Replace Transmission Oil Temperature Switch.
- M36 Replace Transmission Oil Cooler Thermal Valve or Adjust Setting to Increase Oil Flow.
- M37 Clear Obstructions in Oil Cooler.
- M38 Check Oil Cooler Fan Operation.
- M39 Replace Transmission Oil Pressure Switch.
- M40 Transmission Pressure Is Low. Inspect Pressure, Relief Valve, Transmission Pump, or for Broken Line.
- M41 Transmission Pressure Is High. Pressure Relief Valve Did Not Open.
- M42 Rotor Light Alarm Did Not Function During Overspeed.
- M43 Rotor Audio Alarm Is On Improperly During Overspeed.
- M44 Rotor Light Alarm Did Not Function During Underspeed.
- M45 Rotor Audio Alarm Did Not Function During Underspeed.
- M46 Rotor Light Alarm Is On Without Cause.
- M47 Rotor Audio Alarm Is On Without Cause.

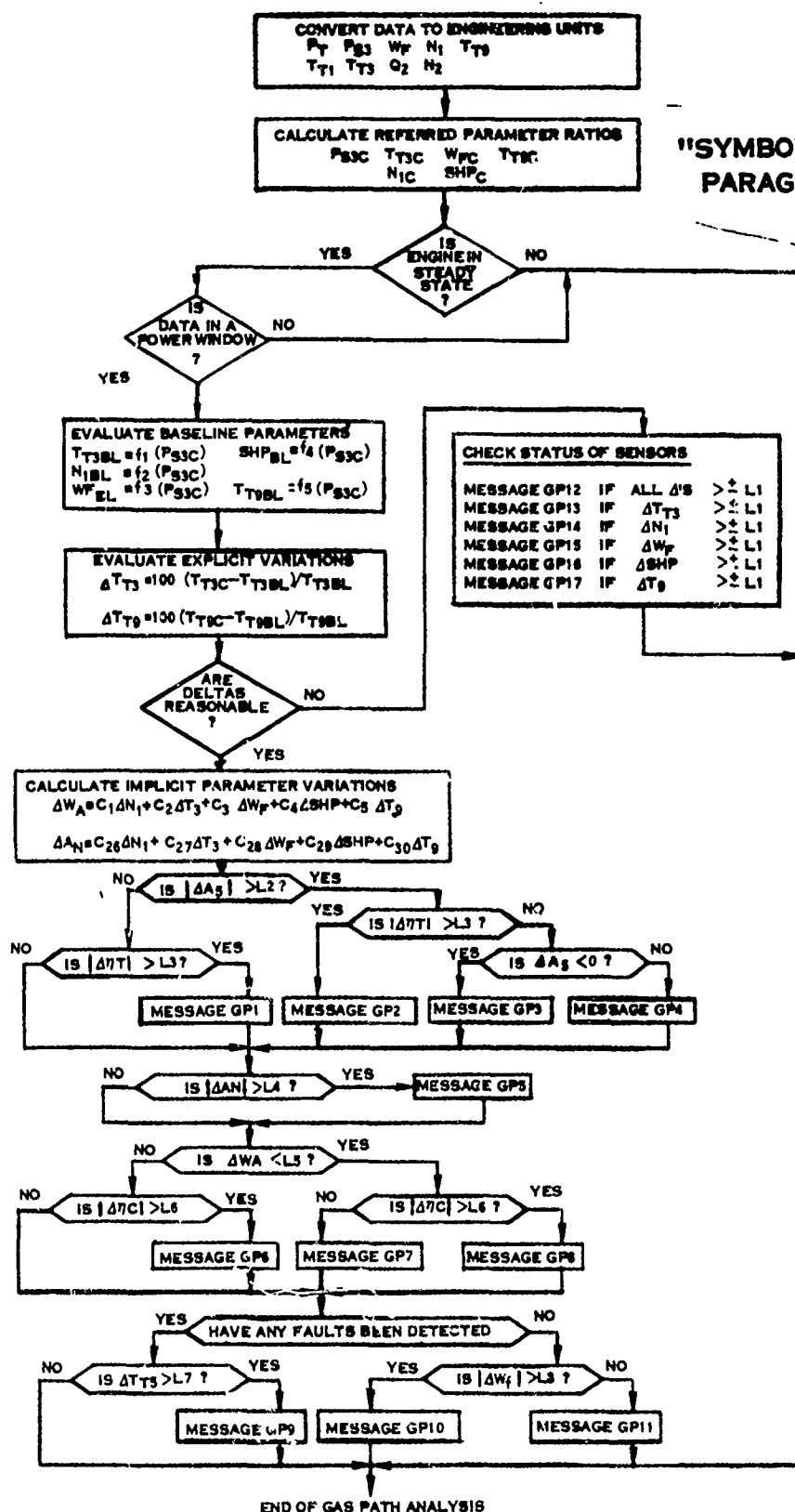
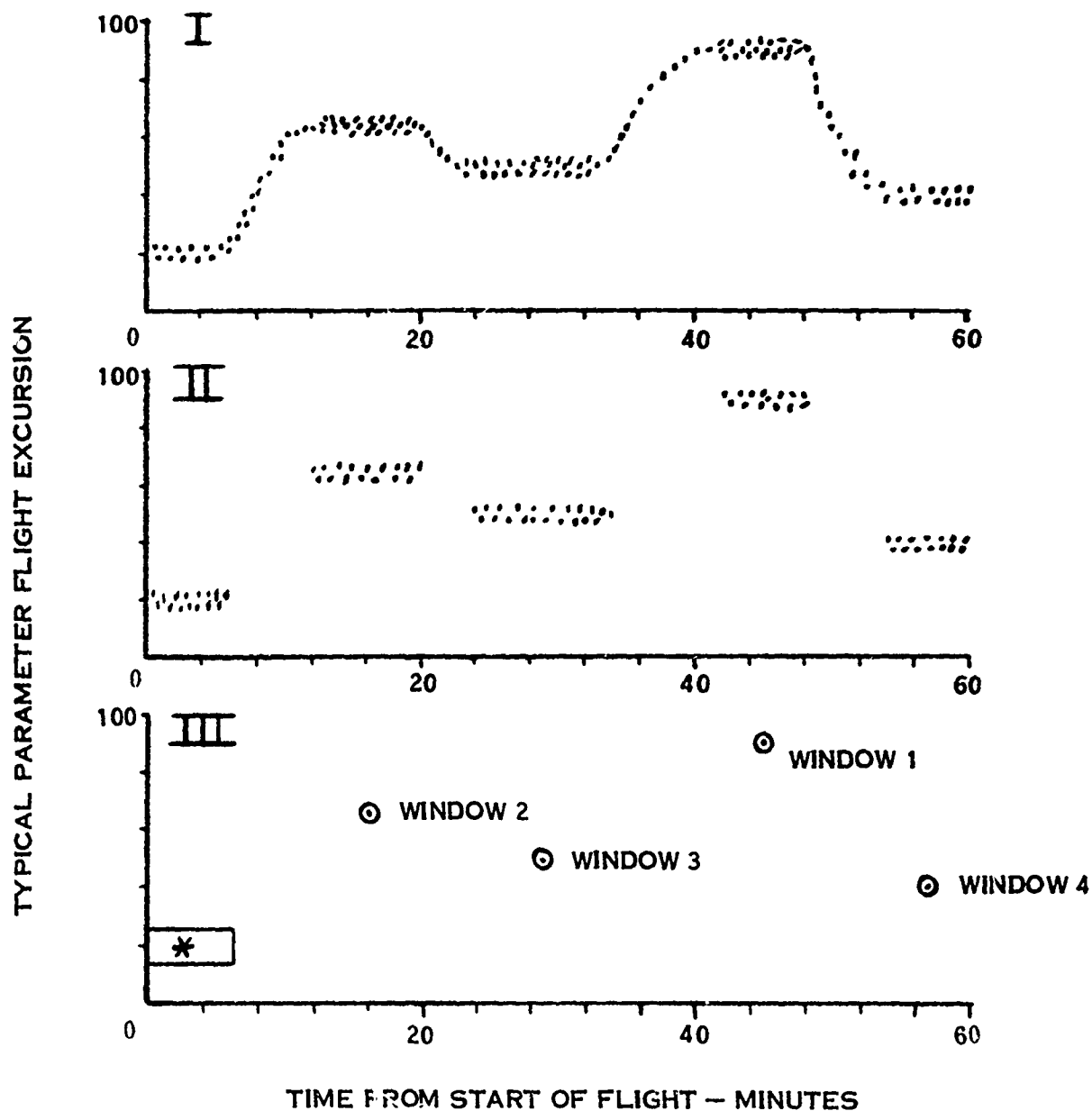


FIGURE 5-40 AIDAPS GAS PATH ANALYSIS FLOW DIAGRAM

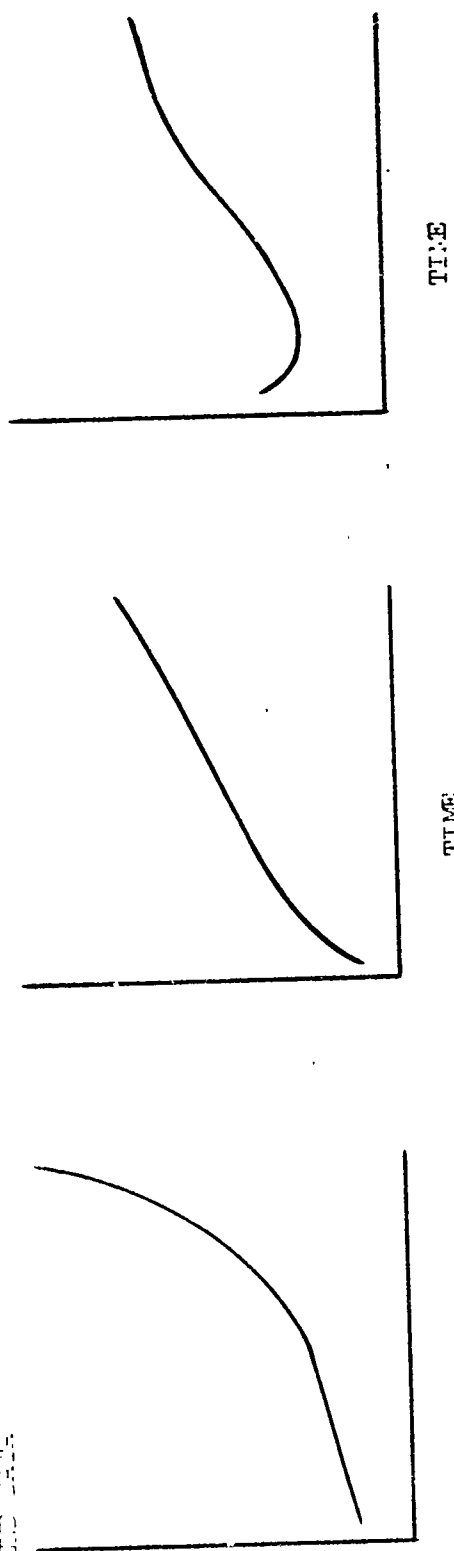


- I : TOTAL FLIGHT DATA
- II : STEADY STATE DATA
- III : EFFECTIVE DATA FOR FLIGHT
- \* : DATA IN THIS ZONE WAS BELOW DESIRED POWER WINDOWS

FIGURE 5-41 FLIGHT DATA COLLECTION & COMPRESSION



ASSUMED TEST DATA



APPROXIMATION TECHNIQUE

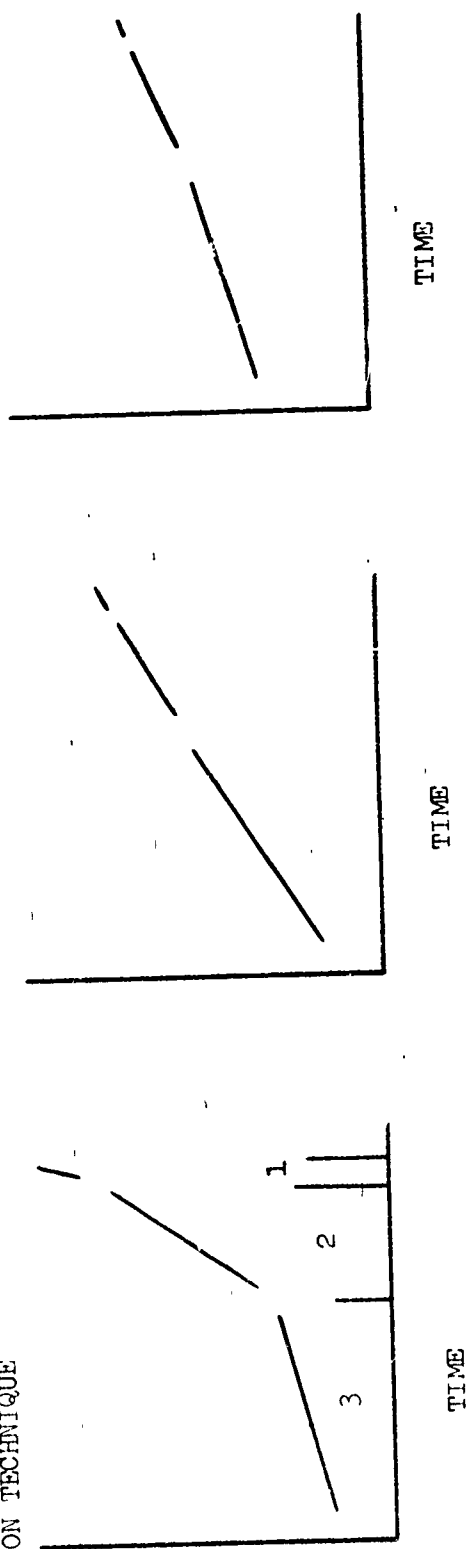


FIGURE 5-42 EXAMPLE OF CURVE FITTING TECHNIQUE

FIGURE 5-43

AIDAPS TREND ANALYSIS LOGIC FLOW

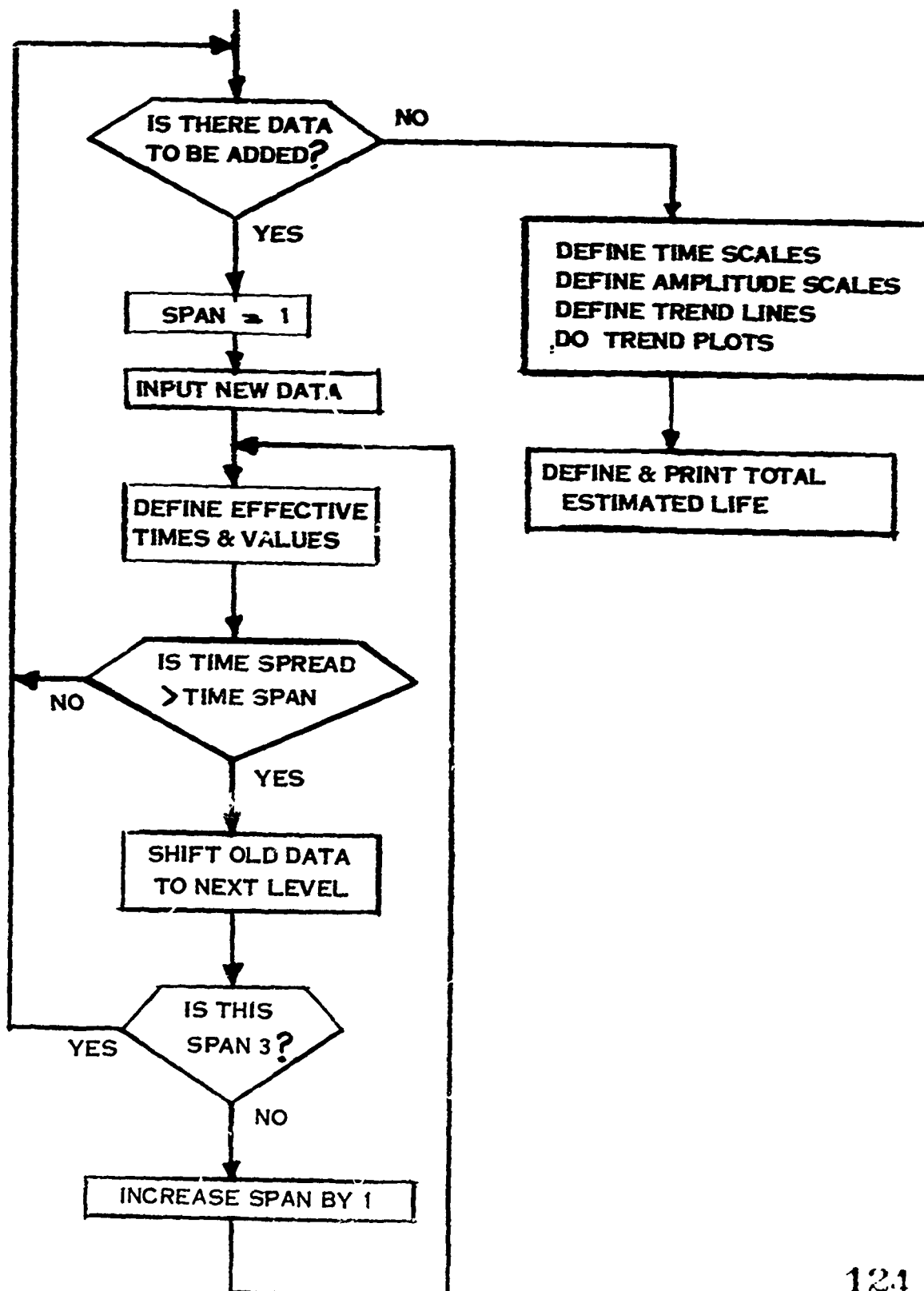


FIGURE 5-44

DERIVATION OF TREND LINE EQUATIONS

A. Definition of data to be utilized in Trend Line is as follows:

- 1) flights occurred at times  $T_1, T_2, T_3, \dots T_i$ ;
- 2) average parameter value for each condition of interest is  $Y_1, Y_2, Y_3, \dots Y_i$ ; and
- 3) number of data frames included in each average parameter value is  $N_1, N_2, N_3, \dots N_i$ .

B. Form of desired Trend Line equation is:

$$Y \text{ average} = a_0 + a_1 T$$

where constants  $a_0$  and  $a_1$  must be evaluated from available data.

C. Definition of intermediate equations:

- 1)  $\sum N = N_1 + N_2 + N_3 + \dots N_i$
- 2)  $\sum Y = Y_1 + Y_2 + Y_3 + \dots Y_i$
- 3)  $\sum T = T_1 + T_2 + T_3 + \dots T_i$
- 4)  $\sum YT = Y_1 T_1 + Y_2 T_2 + Y_3 T_3 + \dots Y_i T_i$
- 5)  $\sum T^2 = T_1^2 + T_2^2 + T_3^2 + \dots T_i^2$

D. Normal equations for defining the coefficients  $a_0$  and  $a_1$  by Least Squares technique are

- 1)  $\sum Y = a_0 \sum N + a_1 \sum T$ ; and
- 2)  $\sum YT = a_0 \sum T + a_1 \sum T^2$

E. Resultant coefficients obtain by solving equations in D above are:

- 1)  $a_0 = \frac{\sum Y \cdot \sum T^2 - \sum T \cdot \sum YT}{\sum N \cdot \sum T^2 - \sum T \cdot \sum T}$ ; and
- 2)  $a_1 = \frac{\sum N \cdot \sum YT - \sum T \cdot \sum Y}{\sum N \cdot \sum T^2 - \sum T \cdot \sum T}$

F. The average Trend Line is thus defined as:

- 1)  $Y \text{ average} = a_0 + a_1 T$

and the effective life indicated by the parameter may be obtained by equating the Trend Line to the malfunction limit.

- 2)  $Y \text{ average} = a_0 + a_1 T = \text{Limit}$

or the time at which the limit is reached is;

- 3)  $T = (\text{Limit} - a_0)/a_1$

TABLE 5.2

RSER 6000  
Volume IIGAS PATH DIAGNOSTIC ACTIONS

GP1	INSPECT $N_1$ TURBINE ROTOR
GP2	REPLACE $N_1$ TURBINE ASSEMBLY
GP3	REPLACE CORRODED $N_1$ TURBINE NOZZLES
GP4	REPLACE BROKEN $N_1$ TURBINE NOZZLES
GP5	REPLACE $N_2$ TURBINE ASSEMBLY
GP6	WARNING: COMPRESSOR EFFICIENCY IS DETEIORATING.
GP7	WARNING: COMPRESSOR PUMPING CAPACITY IS DETEIORATING. CHECK IGV AND BLEED/PAID OPERATION
GP8	BAD COMPRESSOR. CHECK FOR VISUAL DAMAGE, IMPROPER IGV OPERATION, EXCESSIVE AIR BLEED OR REPLACE COMPRESSOR
GP9	PERFORM INTERNAL (HOT END) INSPECTION
GP10	INSPECT BURNER NOZZLES, LINER AND DIFFUSER FOR WEAR, OR CLOGGING
GP11	ENGINE PASSED ALL TESTS, NO PROBLEMS DETECTED
GP12	REPLACE OR CALIBRATE $P_{S3}$ , $P_T$ & $T_{T1}$ SENSORS
GP13	REPLACE OR CALIBRATE $T_{T3}$ SENSOR
GP14	REPLACE OR CALIBRATE $N_1$ SENSOR
GP15	REPLACE OR CALIBRATE $W_P$ SENSOR
GP16	REPLACE OR CALIBRATE $Q_Z$ & $N_Z$ SENSORS
GP17	REPLACE OR CALIBRATE $T_{T9}$ SENSORS

TABLE 5.3

AIDAPS TEND PARAMETERS
GAS PATH PARAMETERS
LIMITS (NOTE 1)

SYMBOL	DEFINITION	LOWER	UPPER	UNITS
D T13	VARIATION OF $T_{13}/\sqrt{0.1}$	-25	25	%
D N1	VARIATION OF $N_1/\sqrt{0.1}$	-25	25	"
D W1	VARIATION OF $W_1/\sqrt{0.1}$	-25	25	"
D SEP	VARIATION OF $SEP/\sqrt{0.1}$	-25	25	"
D T19	VARIATION OF $T_{19}/0.1$	-25	25	"
D T15	VARIATION OF $T_{15}/0.1$	NA	10	"
D WAIR	VARIATION OF $W_{AIR}/\sqrt{0.1}$	-6	NA	"
D ETA C	VARIATION OF COMP. EFFICIENCY	-6	NA	"
D N1A	VARIATION OF N1 TURBINE AREA	-6	6	"
D ETA N1	VARIATION OF N1 TURBINE EFFICIENCY	-6	NA	"
D ETA N2	VARIATION OF N2 TURBINE EFFICIENCY	-6	6	"

MECHANICAL PARAMETERS
LIMITS (NOTE 2)

SYMBOL	DEFINITION	LOWER	UPPER	UNITS
SB VOLTS	START BATTERY VOLTAGE	21	NA	VOLTS
EOP	ENGINE OIL PRESSURE	27	NA	PSI
EOT	ENGINE OIL TEMPERATURE	NA	250	°F
FUEL P	FUEL PRESSURE	4	NA	PSI
HYD P	HYDRAULIC PRESSURE	500	1150	PSI
42 CB DT	42 DEG. GEARBOX TEMPERATURE RISE	NA	130	°F
90 CB DT	90 DEG. GEARBOX TEMPERATURE RISE	NA	130	°F
ERG 2 DT	BEARING 2 TEMPERATURE RISE	NA	220	°F
HYD FLOW	HYDRAULIC PUMP LEAKAGE FLOW	NA	0.45	GPM
PUMP DT	HYDRAULIC PUMP TEMPERATURE RISE	NA	50	°F
OC FLOW	TRANSMISSION OIL COOLER FLOW	250	4960	PPH
TOP	TRANSMISSION OIL PRESSURE	29	70	PSI
TOT	TRANSMISSION OIL TEMPERATURE	NA	230	°F
ERG 3 DT	BEARING 3 & 4 TEMPERATURE RISE	NA	220	°F
ACEB 115	AC ESSENTIAL BUS VOLTAGE	110	120	VOLTS
ACIB 26	AC INSTRUMENT BUS VOLTAGE	25.4	26.6	VOLTS
DCEB 28	DC ESSENTIAL BUS VOLTAGE	26	29	VOLTS

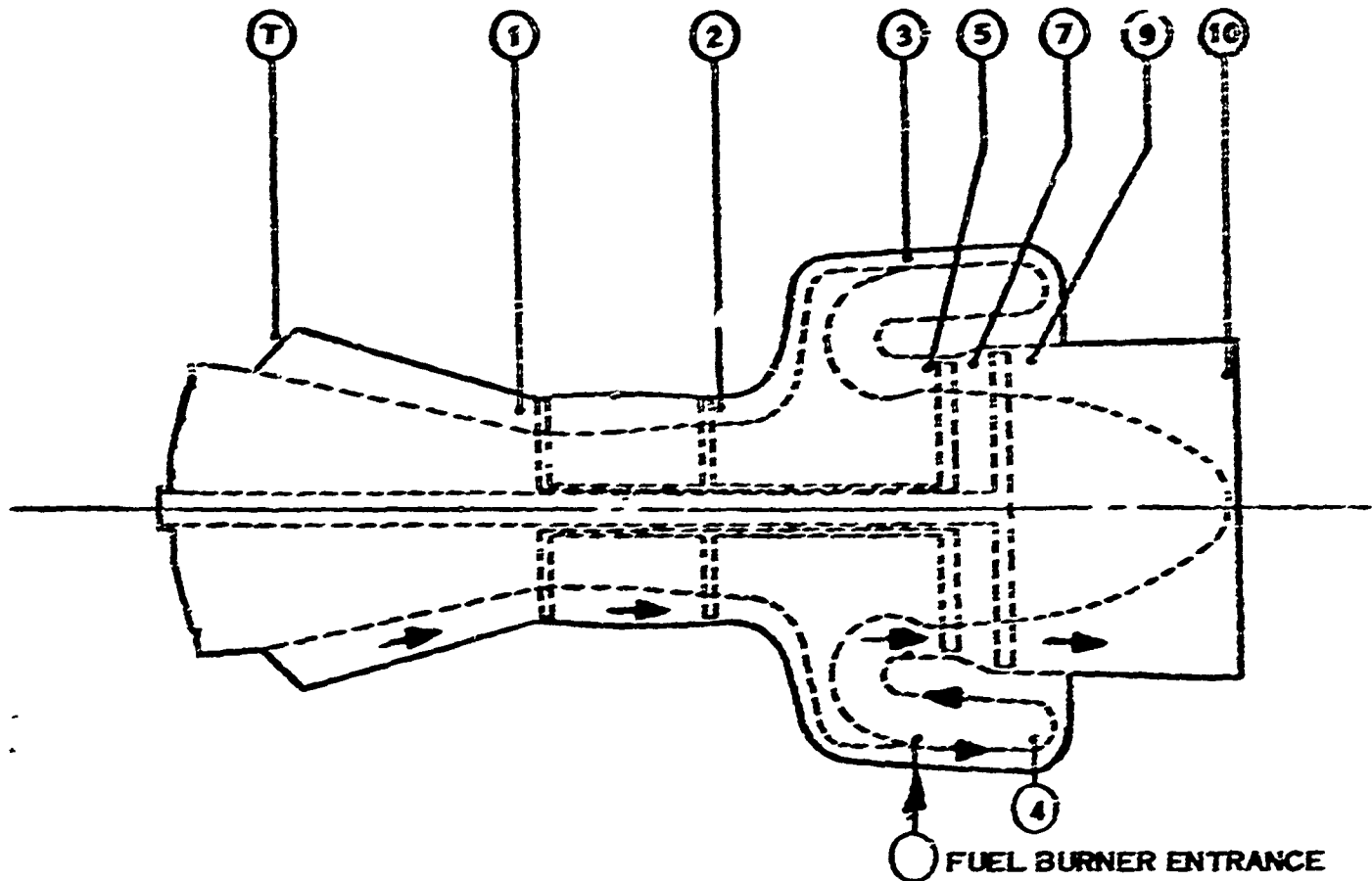
NA INDICATES NO APPLICABLE LIMIT

NOTE 1: GAS PATH LIMITS DERIVED BY HAMILTON STANDARD

NOTE 2: MECHANICAL LIMITS EXTRACTED FROM GOVERNMENT DATA

**SECTION 6**  
**SIGNATURE DEFINITION**  
**AND**  
**ANALYSIS OF FLIGHT DATA**

# T53 ENGINE STATION DIAGRAM UH-1H



- |                                     |                                   |
|-------------------------------------|-----------------------------------|
| (T) ENGINE INLET                    | (5) GAS PRODUCER TURBINE ENTRANCE |
| (1) AXIAL COMPRESSOR ENTRANCE       | (7) POWER TURBINE ENTRANCE        |
| (2) CONTRIFUGAL COMPRESSOR ENTRANCE | (9) EXHAUST DIFFUSER ENTRANCE     |
| (3) COMPRESSOR DIFFUSER EXIT        | (10) EXHAUST DIFFUSER EXIT        |
| (4) FUEL BURNER EXIT                |                                   |

FIGURE 6-1 T53-L13 ENGINE SCHEMATIC

## SIMPLIFIED FLOW DIAGRAM

### TS3L13 ENGINE GAS PATH ANALYSIS

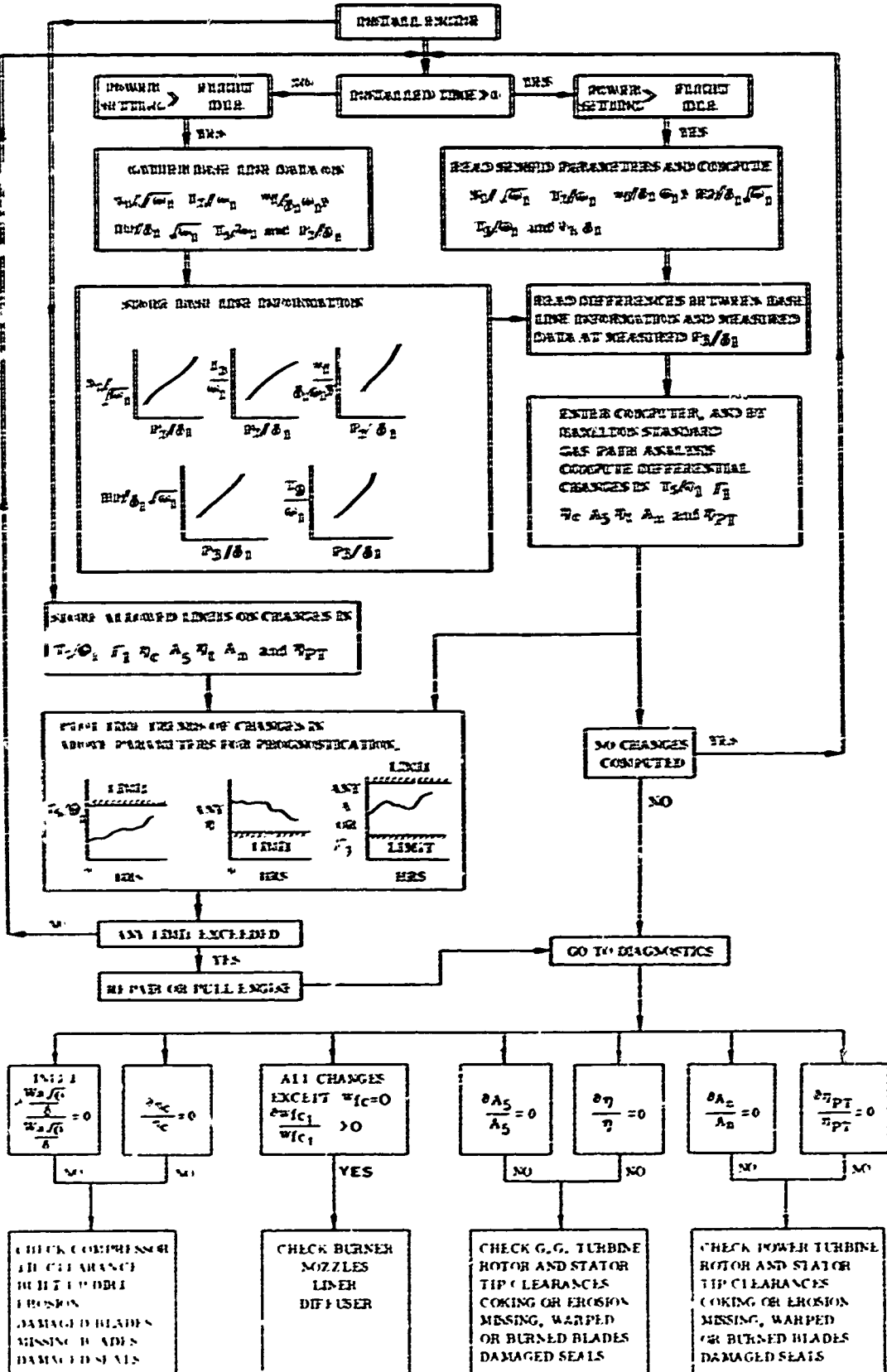




FIGURE 6-3 AIDAPS GAS PATH ANALYSIS SUMMARY FOR SIGNATURE DEVIATIONS

CONSIDERATIONS: DIAGNOSTICS OBTAINED WITH DETERIORATIONS OF LESS THAN 1%

INSERTED COMPONENT	BASELINE = f(P <sub>2</sub> /A <sub>1</sub> )		BASELINE = f(N <sub>1</sub> /A <sub>1</sub> )		ANALYSIS OF TEST CELL DATA
	WITHOUT NOISE REJECTION	WITH NOISE REJECTION	WITHOUT NOISE REJECTION	WITH NOISE REJECTION	
Bearing 2 (LE 15615)	No Gas Path Fault (Correct Diagnostic)	No Gas Path Fault (Correct Diagnostic)	Degraded N <sub>1</sub> Nozzles Degraded Compressor (Wrong Diagnostic)	Degraded Compressor Degraded N <sub>1</sub> Nozzles (Wrong Diagnostic)	No Gas Path Fault (Correct Diagnostic)
Bearing 3 (LE 20727)	No Gas Path Fault (Correct Diagnostic)	Degraded N <sub>2</sub> Turbine (Wrong Diagnostic)	No Gas Path Fault (Correct Diagnostic)	Degraded N <sub>2</sub> Turbine Degraded N <sub>1</sub> Turbine (Wrong Diagnostic)	No Gas Path Fault (Correct Diagnostic)
Bearing 4 (LE 15351)	No Gas Path Fault (Correct Diagnostic)	Degraded N <sub>2</sub> Turbine (Wrong Diagnostic)	No Gas Path Fault (Correct Diagnostic)	Degraded N <sub>2</sub> Turbine Degraded N <sub>1</sub> Turbine Degraded Compressor (Wrong Diagnostic)	No Gas Path Fault (Correct Diagnostic)
N <sub>1</sub> Nozzles (LE 15615)	No Gas Path Fault (Possible Diagnostic)	Degrade N <sub>2</sub> Turbine (Wrong Diagnostic)	Degraded N <sub>2</sub> Turbine Degraded N <sub>1</sub> Nozzles (Wrong Diagnostic)	Degraded N <sub>2</sub> Turbine Degraded N <sub>1</sub> Nozzles (Wrong Diagnostic)	No Gas Path Fault (Possible Diagnostic)
N <sub>2</sub> Nozzles (LE 18993)	Degraded N <sub>2</sub> Turbine Degraded Compressor Degraded N <sub>1</sub> Turbine (Isolated Primary Fault)	Degraded N <sub>2</sub> Turbine Degraded Compressor (Isolated Primary Fault)	Degraded N <sub>2</sub> Turbine (Correct Diagnostic)	Degraded N <sub>2</sub> Turbine Degraded Compressor (Isolated Primary Fault)	Degraded Compressor Degraded N <sub>1</sub> Turbine Degraded N <sub>2</sub> Turbine (Wrong Diagnostic)
N <sub>2</sub> Nozzles (LE 20727)	No Gas Path Fault (Possible Diagnostic)	Degraded N <sub>2</sub> Turbine (Correct Diagnostic)	No Gas Path Fault (Possible Diagnostic)	No Gas Path Fault (Possible Diagnostic)	No Gas Path Fault (Possible Diagnostic)
N <sub>2</sub> Turbine (LE 15351)	Not Gas Path Fault (Possible Diagnostic)	No Gas Path Fault (Possible Diagnostic)	No Gas Path Fault (Possible Diagnostic)	Degraded N <sub>2</sub> Turbine Degraded N <sub>1</sub> Turbine (Isolated Primary Fault)	No Gas Path Fault (Possible Diagnostic)
Compressor (LE 15615) (Note 1)	Degraded N <sub>2</sub> Turbine (Wrong Diagnostic)	Degraded N <sub>1</sub> Turbine (Wrong Diagnostic)	Degraded N <sub>1</sub> Turbine (Wrong Diagnostic)	Degraded N <sub>1</sub> Turbine Degraded Compressor (Wrong Diagnostic)	Degraded Compressor Degraded N <sub>1</sub> Nozzles Degraded N <sub>2</sub> Turbine (Isolated Primary Fault)

Possible Diagnostic Indicates Part Deterioration May Not Be Sufficient To Warrant Removal.

Note 1: Compressor Data Was Obtained Before Final Data Acquisition Technique Was Established.

## EXPLICIT PARAMETERS

BEARING #2		$\Delta N_1$	$\Delta T_3$	$\Delta W_f$	$\Delta SHP$	$\Delta T_9$
$\frac{PS_3}{\delta_1}$	NO DEADBAND	.03	-.39	-3.29	-4.74	-.57
	WITH DEADBAND	0.	-.02	-.74	-3.28	-.21

BEARING #2		$\Delta PS_3$
$\frac{N_1}{\sqrt{\theta_1}}$	NO DEADBAND	-.73
	WITH DEADBAND	-.13

N1 NOZZLES		$\Delta N_1$
$\frac{PS_3}{\delta_1}$	NO DEADBAND	-.07
	WITH DEADBAND	0.

N1 NOZZLES		$\Delta PS_3$
$\frac{N_1}{\sqrt{\theta_1}}$	NO DEADBAND	-.14
	WITH DEADBAND	0.

## TEST CELL

N1 NOZZLES		$\Delta N_1$
$\frac{PS_3}{\delta_1}$	NO DEADBAND	0.
	WITH DEADBAND	0.

		$\Delta PS_3$
$\frac{N_1}{\sqrt{\theta_1}}$	NO DEADBAND	
	WITH DEADBAND	

## IMPLICIT PARAMETERS

$\Delta T_5$	$\Delta W_A$	$\Delta T_C$	$\Delta A_5$	$\Delta T_T$	$\Delta A_N$
-.96	-1.64	.91	-2.22	-1.51	.15
-.60	.59	.05	.12	-.51	1.70

-.57	-4.87	1.36	-4.24	-2.66	-1.90
-.42	-2.86	1.11	-3.06	-2.17	-.85

-1.71	2.83	.95	1.58	-.21	2.97
-1.09	2.41	.09	1.80	.52	2.42

-2.48	4.25	1.10	3.12	.54	4.14
-2.04	4.37	.51	3.30	1.14	3.74

1.10	-2.97	0.	-2.27	0.	-3.83
.45	-1.01	0.	-.69	.21	-1.64


FIGURE 6-4 AIDAPS GASPATH ENGINE DATA LE 15615

## EXPLICIT PARAMETERS

COMPRESSOR		$\Delta N_1$	$\Delta T_3$	$\Delta W_f$	$\Delta SHP$	$\Delta T_9$
$\frac{PS_3}{\delta_1}$	NO DEADBAND	-.52	-.32	-4.26	-9.10	0.
	WITH DEADBAND	-.23	0.	-1.71	-7.64	0.

COMPRESSOR		$\Delta PS_3$
$\frac{N_1}{\sqrt{\theta_1}}$	NO DEADBAND	1.63
	WITH DEADBAND	1.03

TEST CELL		$\Delta N_1$
$\frac{PS_3}{\delta_1}$	NO DEADBAND	1.27
	WITH DEADBAND	.98

		$\Delta PS_3$
$\frac{N_1}{\sqrt{\theta_1}}$	NO DEADBAND	
	WITH DEADBAND	

		$\Delta N_1$
$\frac{PS_3}{\delta_1}$	NO DEADBAND	
	WITH DEADBAND	

		$\Delta PS_3$
$\frac{N_1}{\sqrt{\theta_1}}$	NO DEADBAND	
	WITH DEADBAND	

## IMPLICIT PARAMETERS

$\Delta T_5$	$\Delta W_A$	$\Delta T_7C$	$\Delta A_5$	$\Delta T_7T$	$\Delta A_N$
-.88	-.69	.74	-3.47	-2.90	1.13
-.90	1.16	0.	-.49	-1.61	3.23

.88	-3.42	1.04	-5.85	-3.67	-1.68
.51	-1.22	.78	-2.78	-2.41	-.11

3.05	-8.69	-2.91	-2.43	.10	-2.78
2.62	-8.62	-2.05	-3.70	-.67	-3.48




FIGURE 6-4 (CONTINUED) AIDAPS GASPATH ENGINE DATA LE 15615 (CONTINUED)

IMPLICIT PARAMETERS

$\Delta T_5$	$\Delta W_A$	$\Delta \eta_C$	$\Delta A_5$	$\Delta \eta_T$	$\Delta A_N$
2.84	-5.94	-1.33	-2.32	2.04	-7.56
2.33	-5.67	-.47	-3.45	1.19	-7.91

1.26	-2.76	-1.34	.22	2.52	-4.50
.83	-2.20	-.49	-.48	1.51	-3.78

6.04	-5.78	-6.98	7.50	8.21	-3.65
5.68	-6.82	-6.11	5.13	7.21	-5.20




EXPLICIT PARAMETERS

N <sub>2</sub> NOZZLES		$\Delta N_1$	$\Delta T_3$	$\Delta W_f$	$\Delta SHP$	$\Delta T_9$
PS3 $\delta_1$	NO DEADBAND	.46	.57	1.57	10.98	1.17
	WITH DEADBAND	.17	.20	0.	9.52	.81

N <sub>2</sub> NOZZLES		$\Delta PS_3$
$N_1/\sqrt{\theta_1}$	NO DEADBAND	-1.25
	WITH DEADBAND	-.65

TEST CELL

N <sub>2</sub> NOZZLES		$\Delta N_1$
PS3 $\delta_1$	NO DEADBAND	2.5
	WITH DEADBAND	2.21

		$\Delta PS_3$
$N_1/\sqrt{\theta_1}$	NO DEADBAND	
	WITH DEADBAND	

		$\Delta N_1$
PS3 $\delta_1$	NO DEADBAND	
	WITH DEADBAND	

		$\Delta PS_3$
$N_1/\sqrt{\theta_1}$	NO DEADBAND	
	WITH DEADBAND	

FIGURE 6-5 AIDAPS GASPETH ENGINE DATA LIE 18993

## EXPLICIT PARAMETERS

BEARING #3		$\Delta N_1$	$\Delta T$	$\Delta W_f$	$\Delta SHP$	$\Delta T_9$
PS3	NO DEADBAND	-.08	-.03	.97	-3.13	.25
$\delta_1$	WITH DEADBAND	0.	-.26	0.	-1.67	0.

BEARING #3		$\Delta PS_3$
$N_1/\sqrt{\theta_1}$	NO DEADBAND	-.11
	WITH DEADBAND	0.

N2 NOZZLES		$\Delta N_1$
PS3	NO DEADBAND	-.28
$\delta_1$	WITH DEADBAND	0.

N2 NOZZLES		$\Delta PS_3$
$N_1/\sqrt{\theta_1}$	NO DEADBAND	1.07
	WITH DEADBAND	.47

		$\Delta N_1$
PS3	NO DEADBAND	
$\delta_1$	WITH DEADBAND	

		$\Delta PS_3$
$N_1/\sqrt{\theta_1}$	NO DEADBAND	
	WITH DEADBAND	

## IMPLICIT PARAMETERS

$\Delta T_5$	$\Delta W_A$	$\Delta T_7C$	$\Delta A_5$	$\Delta T_7T$	$\Delta A_N$
-.65	2.09	1.46	1.32	-1.89	3.03
-.37	.57	.60	.31	-.80	1.18

-.75	3.46	-.13	3.20	.42	3.71
-.07	.22	0.	.18	.05	.20

-.82	3.52	1.70	2.01	-1.40	2.88
-.17	.01	.84	-.08	-.70	.04

.32	2.29	1.67	.77	-1.65	1.34
.29	.60	.52	-.02	-.86	.52



FIGURE 6-6 AIDAPS GASPATH ENGINE DATA LE 20727

## EXPLICIT PARAMETERS

BEARING #4		$\Delta N_1$	$\Delta T_3$	$\Delta W_f$	$\Delta SHP$	$\Delta T_9$
PS3	NO DEADBAND	-.10	.58	-2.06	1.19	-.55
$\delta_1$	WITH DEADBAND	0.	.21	0.	0.	-.19

BEARING #4		$\Delta PS_3$
$N_1/\sqrt{\theta_1}$	NO DEADBAND	.74
	WITH DEADBAND	.14

POWER TURBINE		$\Delta N_1$
PS3	NO DEADBAND	0.
$\delta_1$	WITH DEADBAND	0.

POWER TURBINE		$\Delta PS_3$
$N_1/\sqrt{\theta_1}$	NO DEADBAND	.25
	WITH DEADBAND	0.

		$\Delta N_1$
PS3	NO DEADBAND	
$\delta_1$	WITH DEADBAND	

		$\Delta PS_3$
$N_1/\sqrt{\theta_1}$	NO DEADBAND	
	WITH DEADBAND	

## IMPLICIT PARAMETERS

$\Delta T_5$	$\Delta W_A$	$\Delta \eta_C$	$\Delta A_5$	$\Delta \eta_T$	$\Delta A_N$
.21	-1.58	-1.35	-1.78	1.58	-2.57
-.09	.42	-.49	.38	.61	.28

.47	-2.79	-1.44	-3.55	2.39	-5.21
.04	-.68	-1.20	-.74	2.17	-2.28

-.85	2.20	-.67	1.75	1.30	1.92
-.48	1.09	0.	.85	.52	.75

-1.39	4.09	-.76	2.97	1.99	3.19
-1.15	2.69	-.26	2.13	1.50	1.84



FIGURE 6-7 AIDAPS GASPETH ENGINE DATA LE 15351

FIGURE 6-8 NUMBER OF GOOD DATA FRAMES ON TYPICAL TREND FLIGHTS

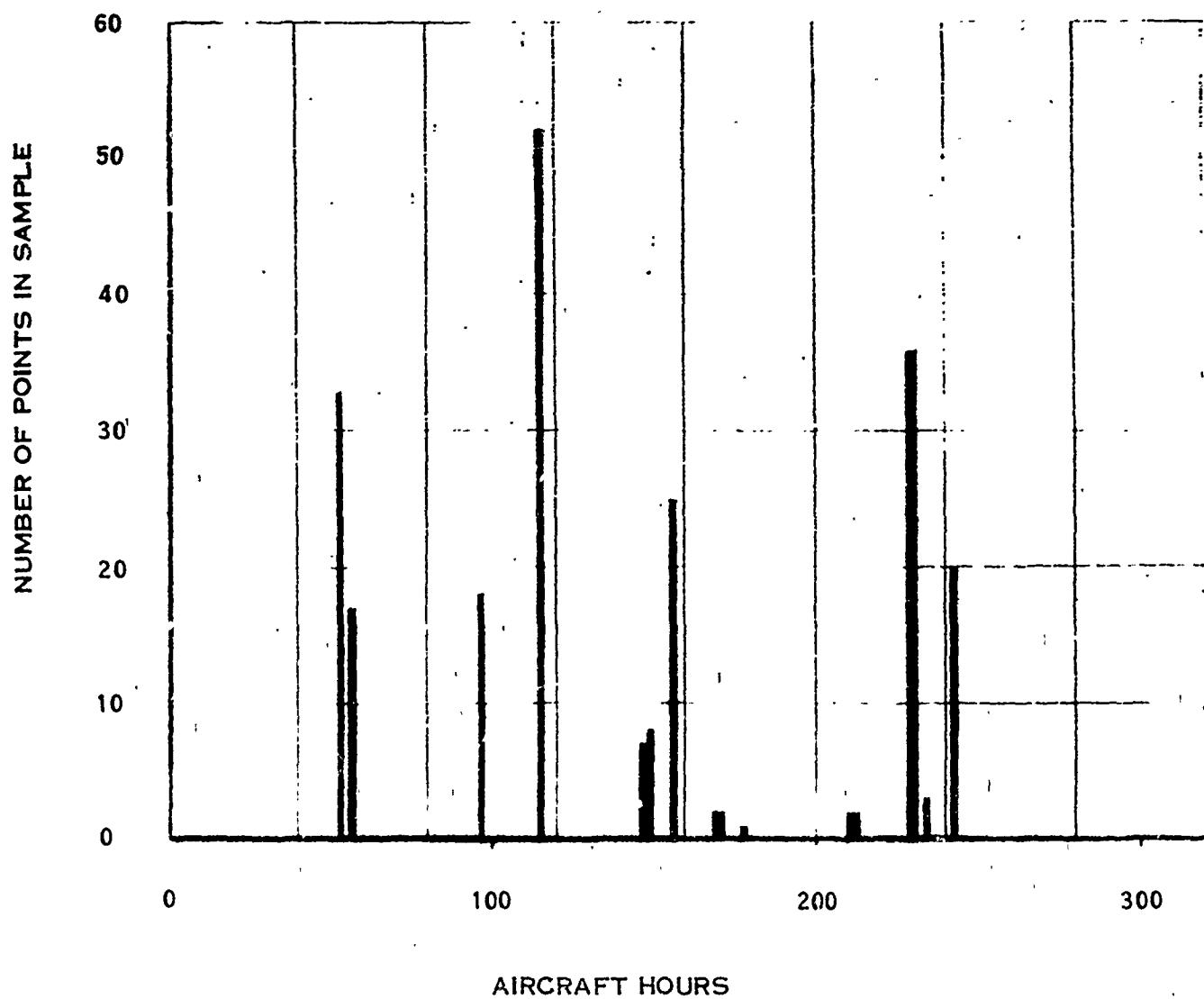


FIGURE 6-9 TREND OF FUEL FLOW

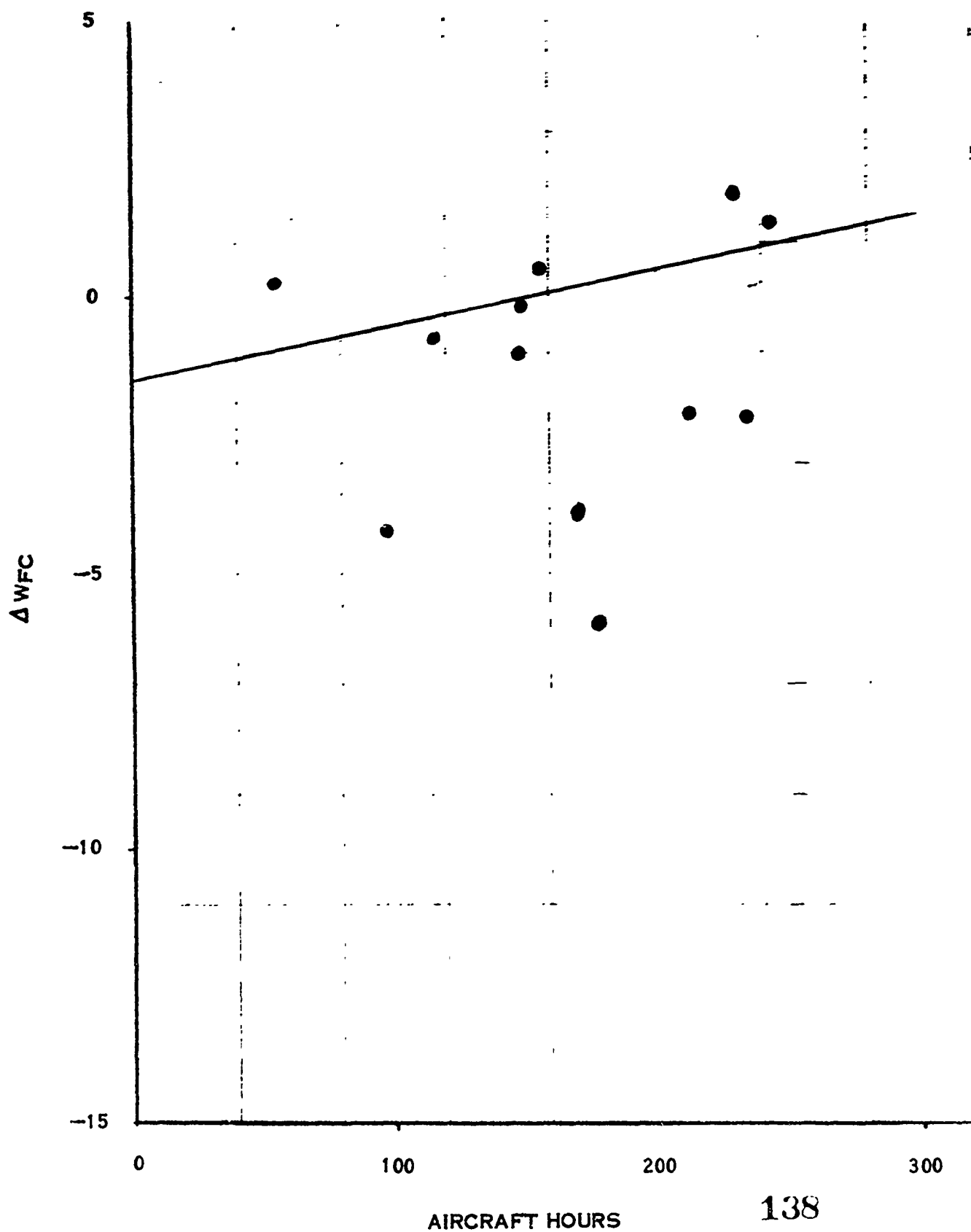




FIGURE 6-10 TREND OF SHIFT HORSEPOWER

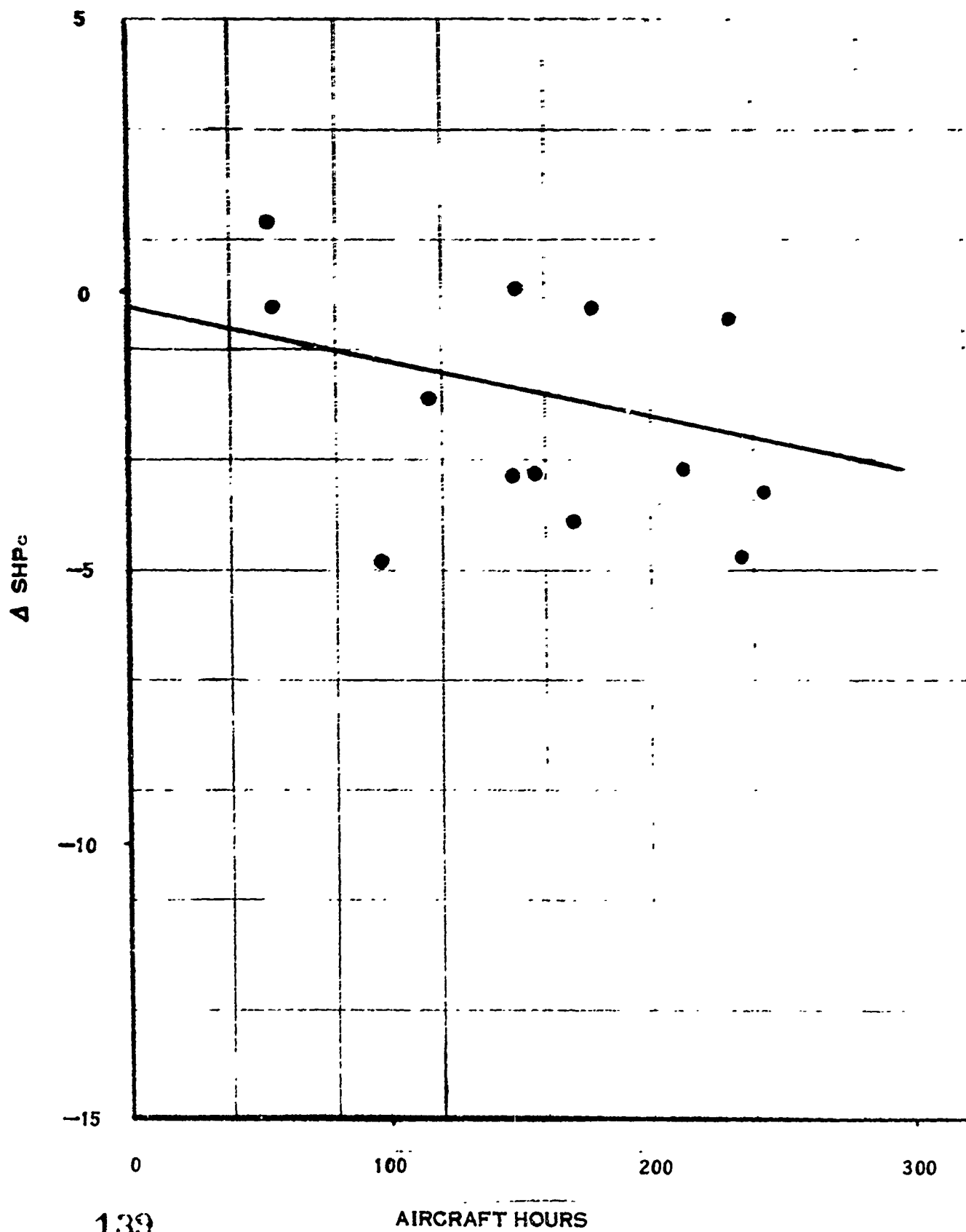


FIGURE 6-11 TREND OF EXHAUST GAS TEMPERATURE

ESER 6080  
Volume II

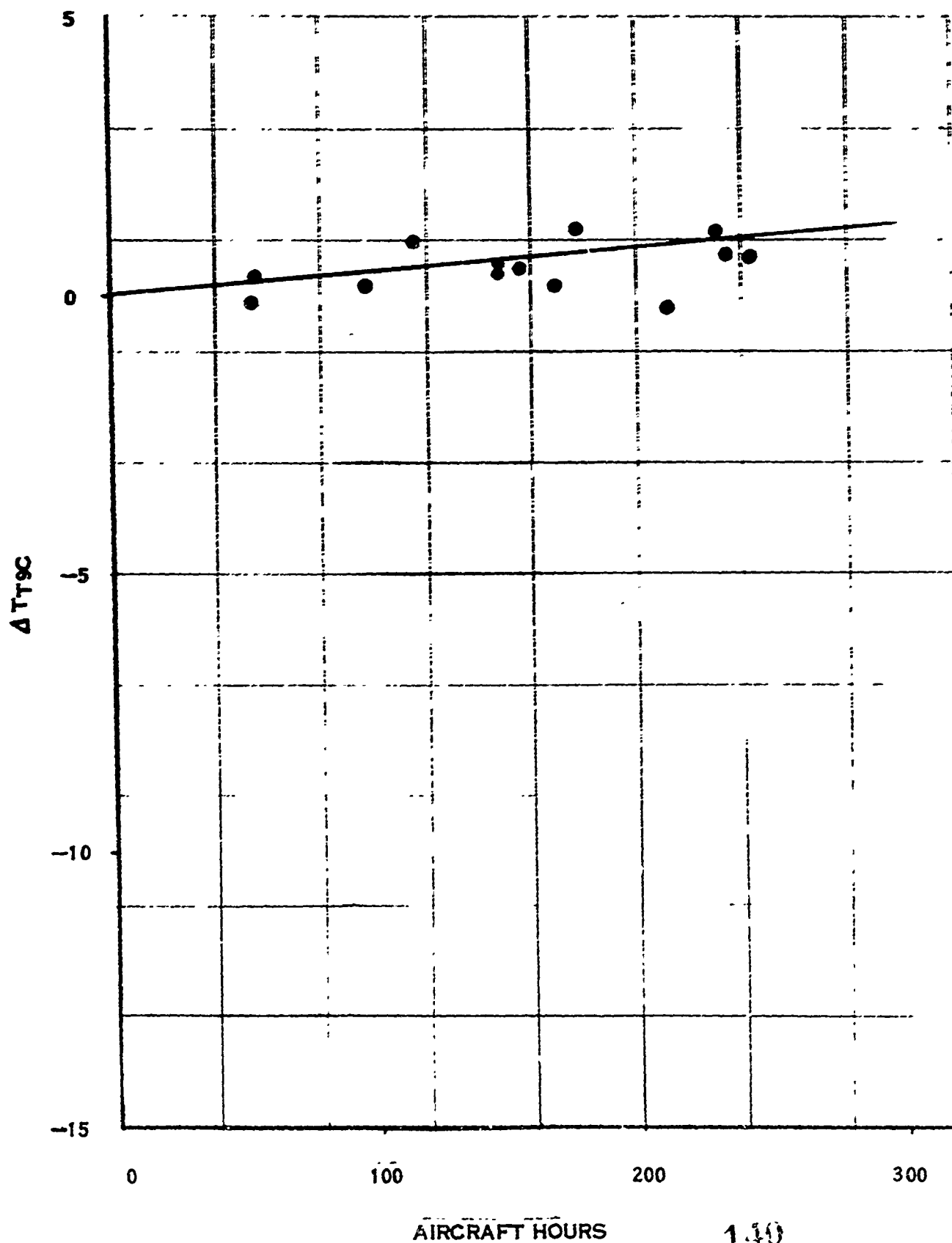


FIGURE 6-12 TREND OF COMPRESSOR TEMPERATURE

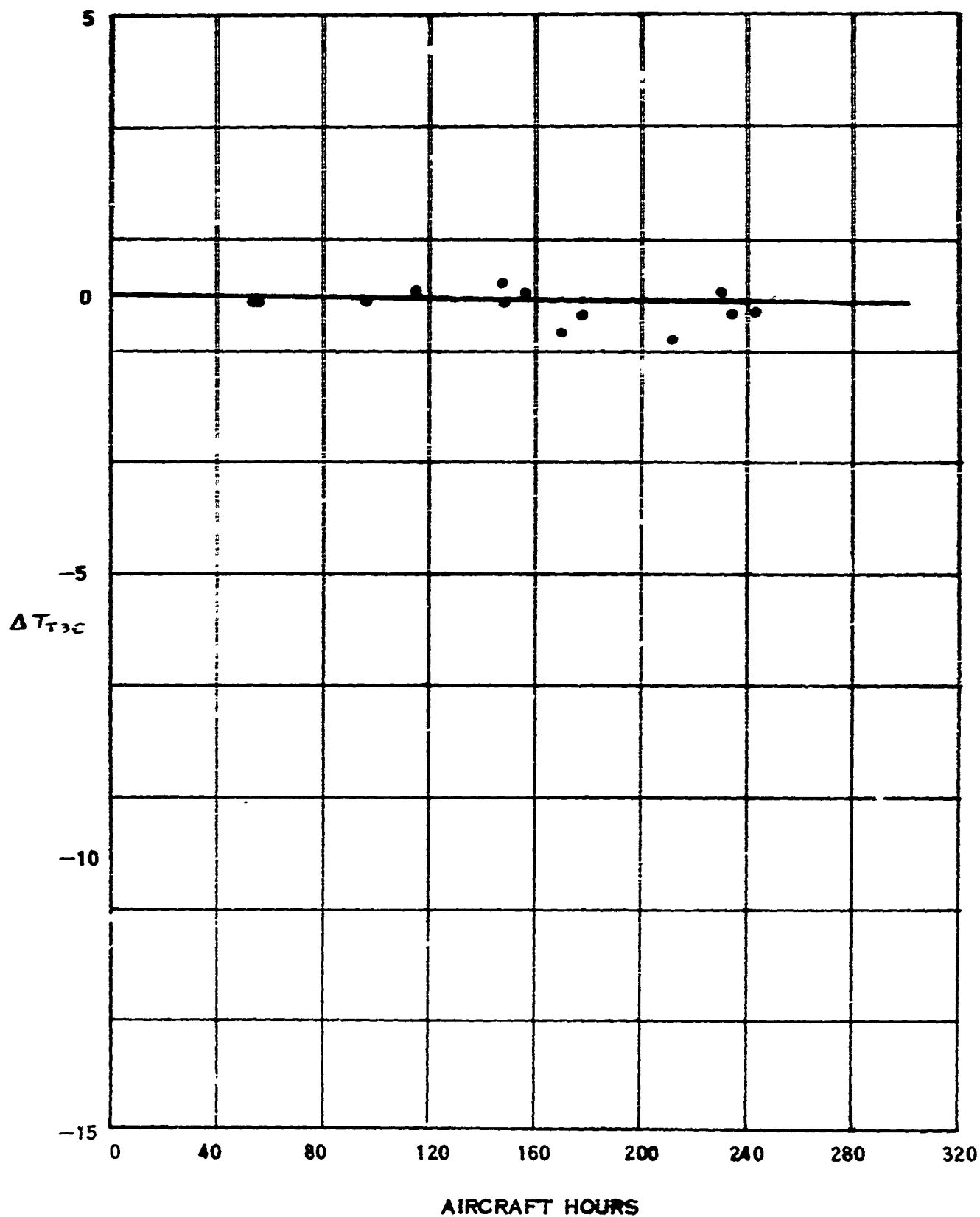


FIGURE 6-13 TREND OF GAS PRODUCER SPEED

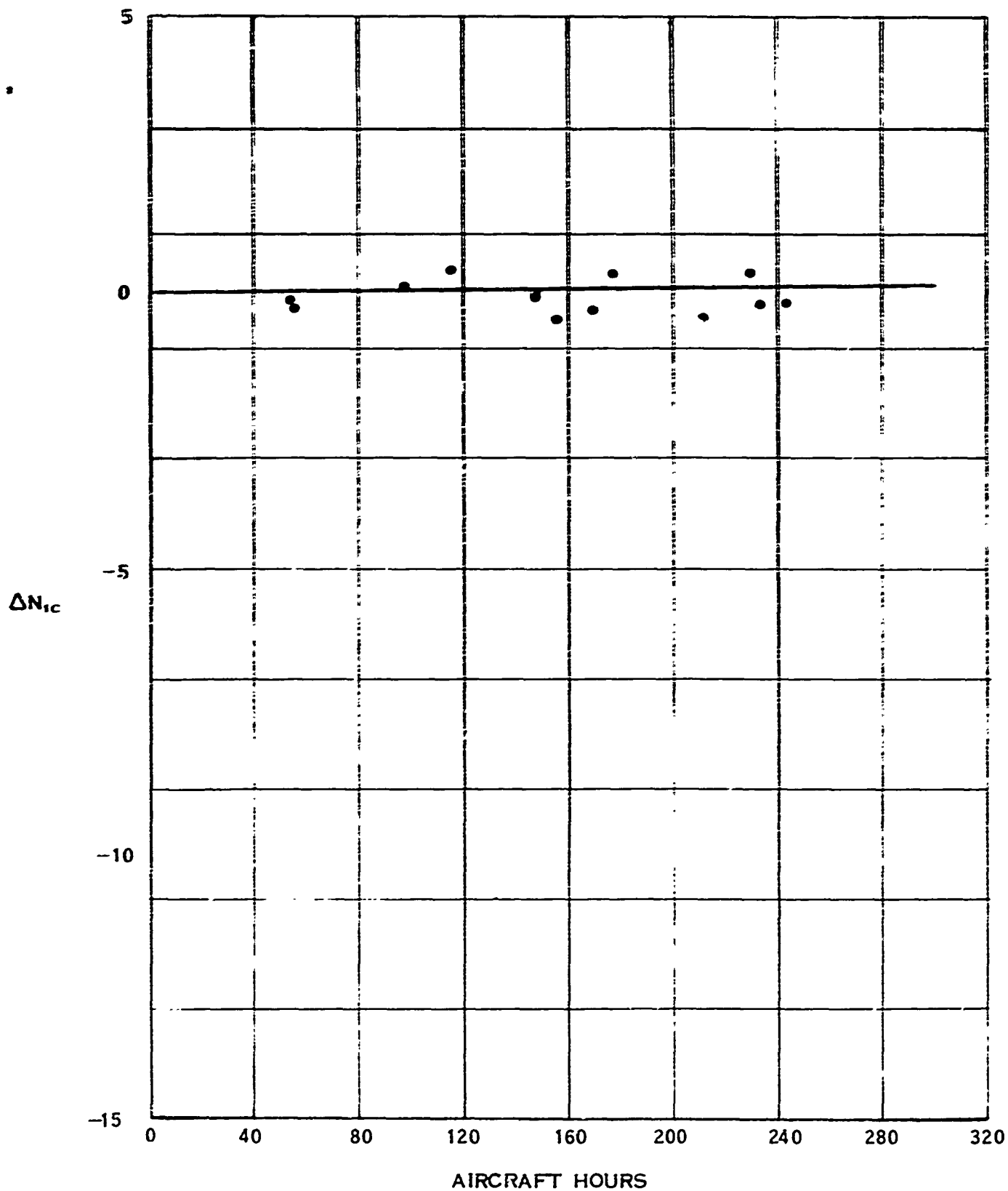


FIGURE 6-14 TREND OF TURBINE INLET TEMPERATURE

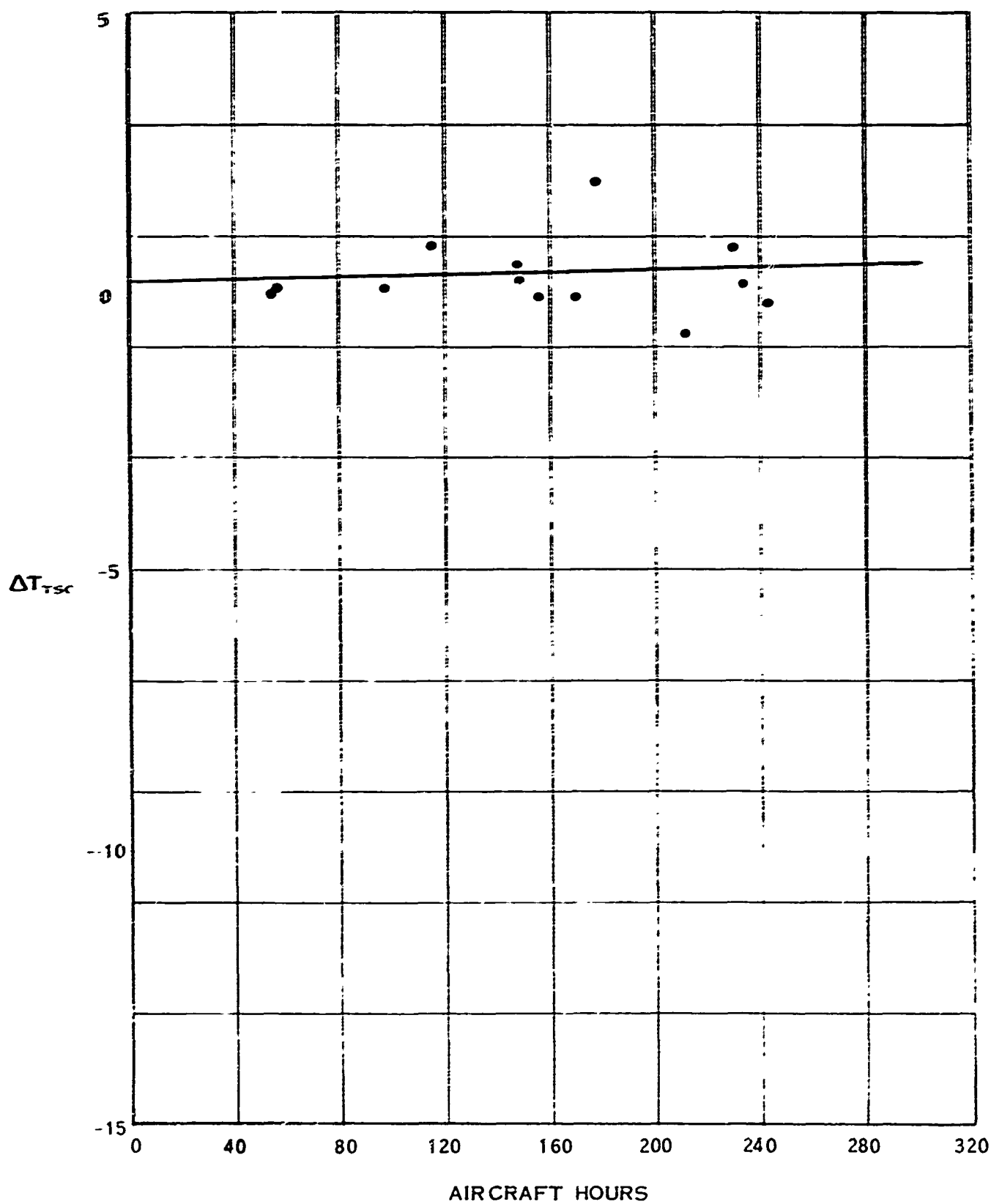


FIGURE 6-15 TREND OF GAS PRODUCER TURBINE AREA

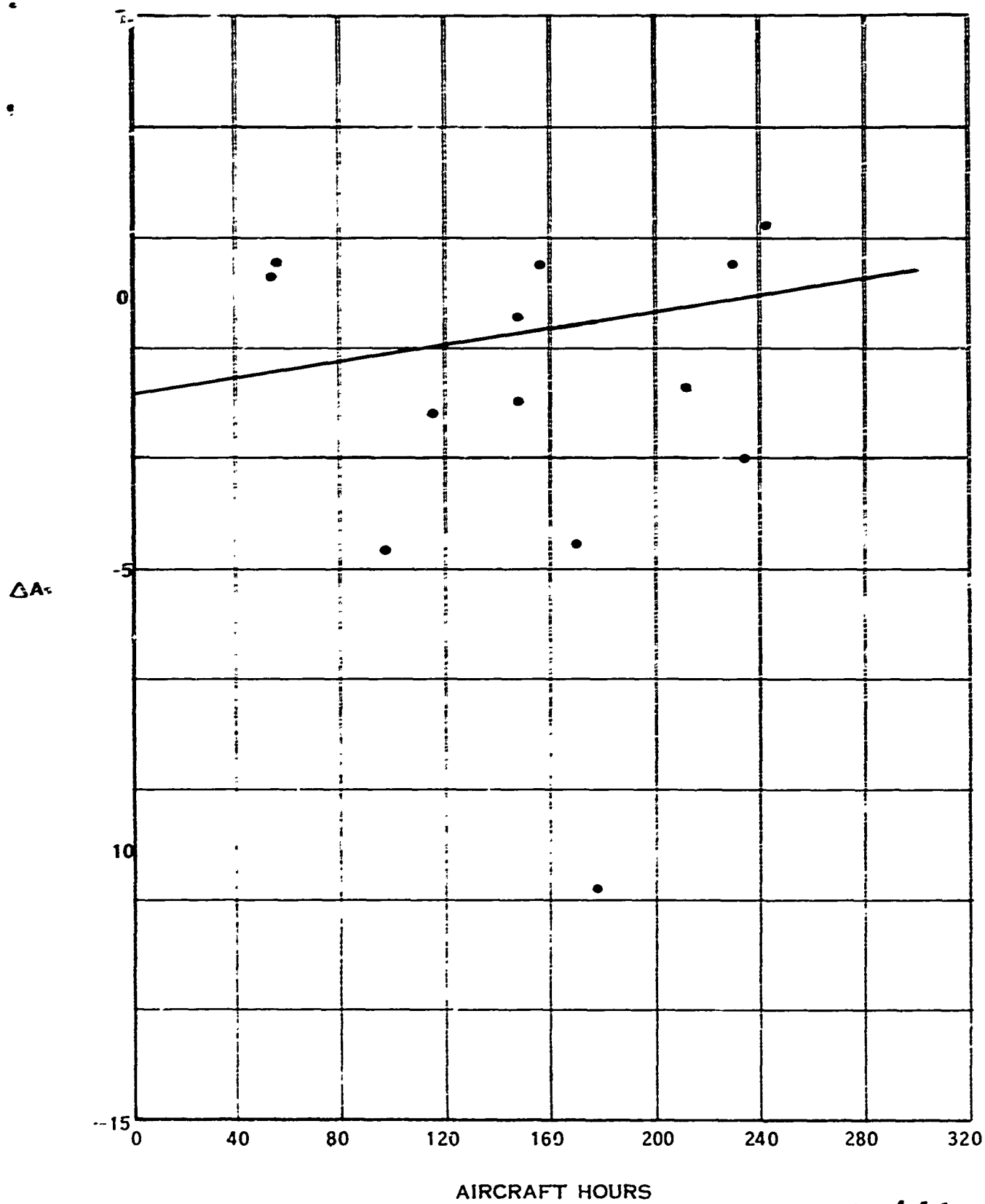


FIGURE 6-15 TREND OF GAS PRODUCER TURBINE EFFICIENCY

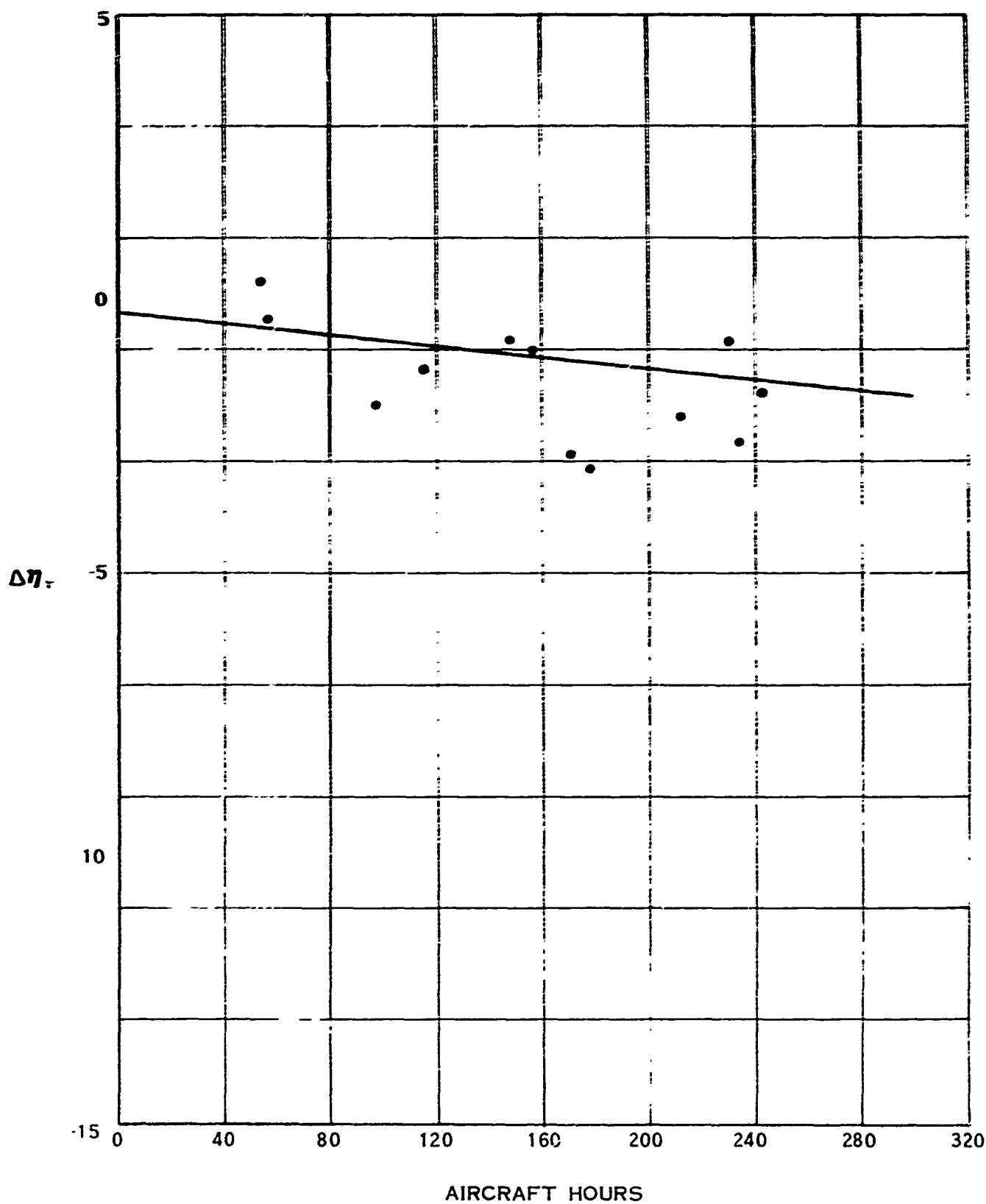


FIGURE 6-17 TREND OF POWER TURBINE AREA

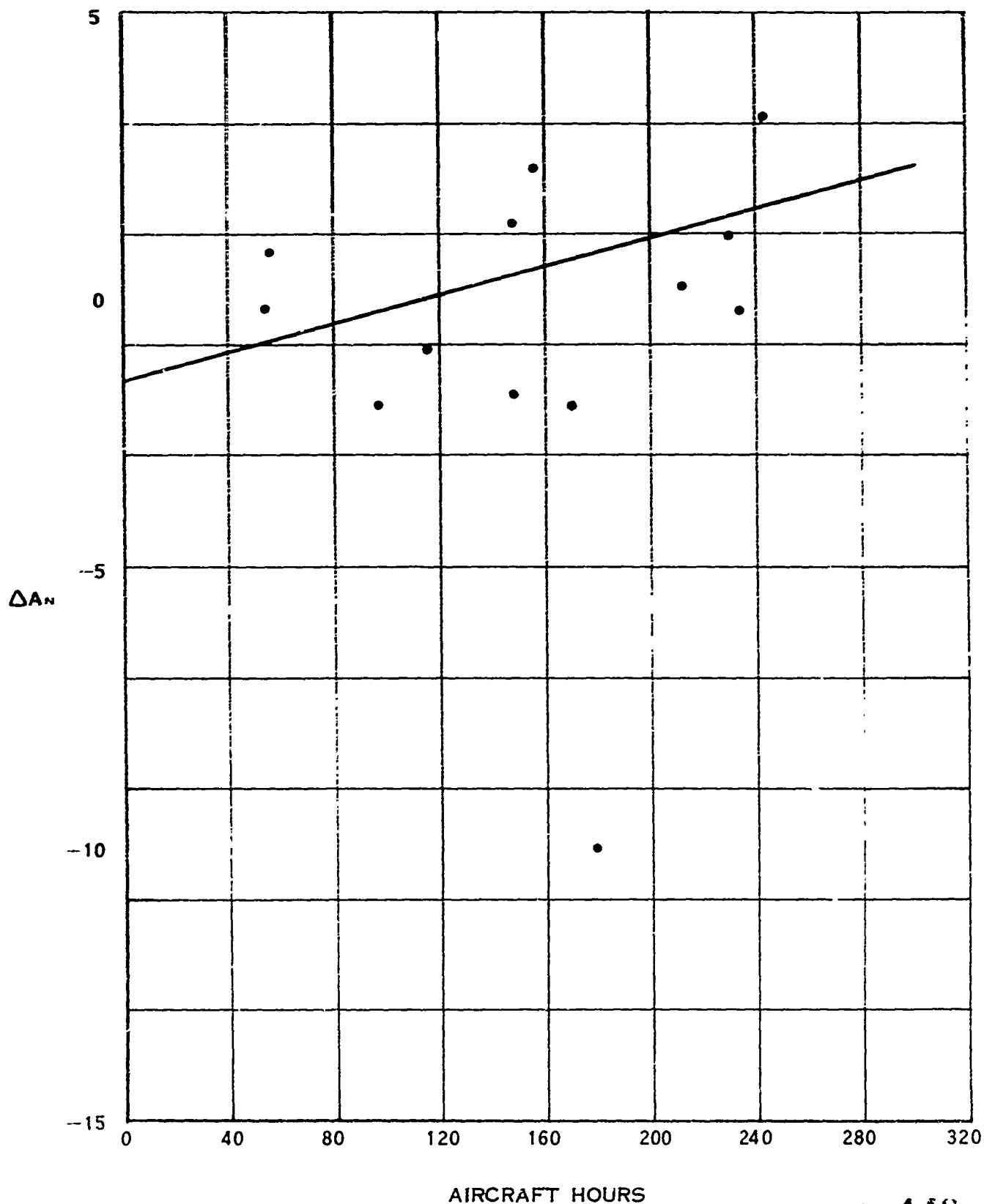




FIGURE 6-18 TREND OF START BATTERY VOLTAGE

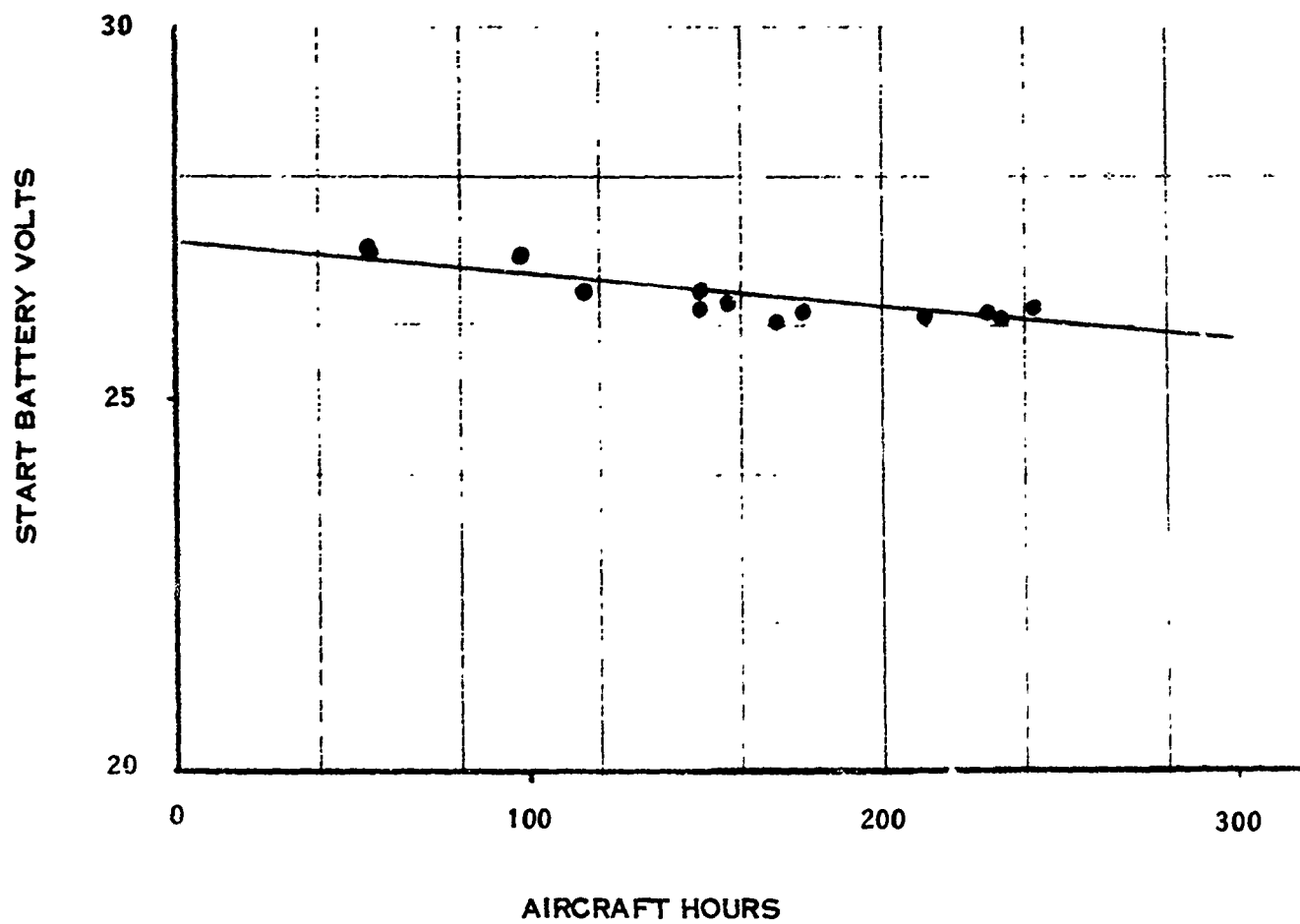


FIGURE 6-19 TREND OF AC ESSENTIAL BUS VOLTAGE

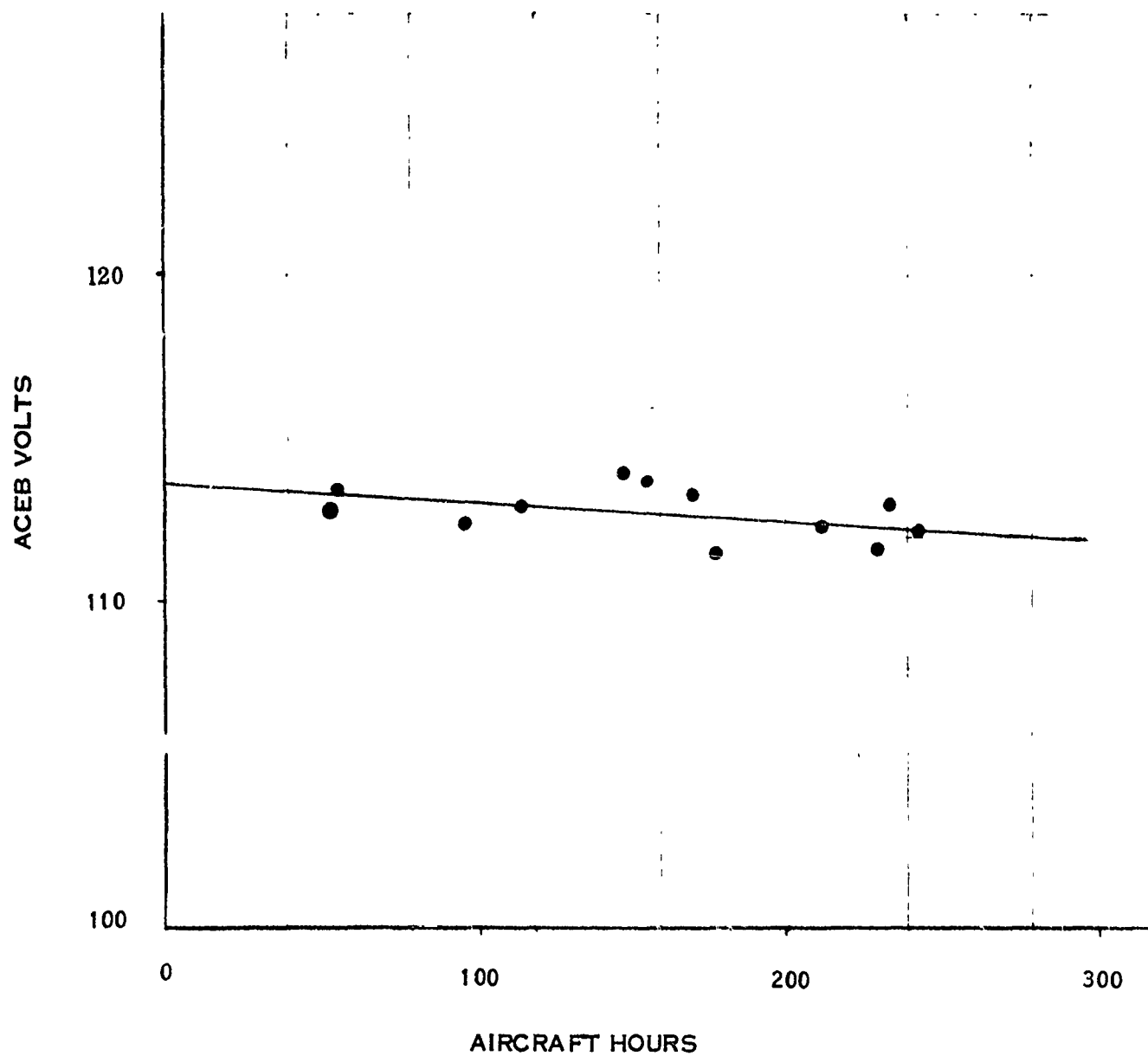


FIGURE 6-20 TREND OF AC INSTRUMENT BUS VOLTAGE

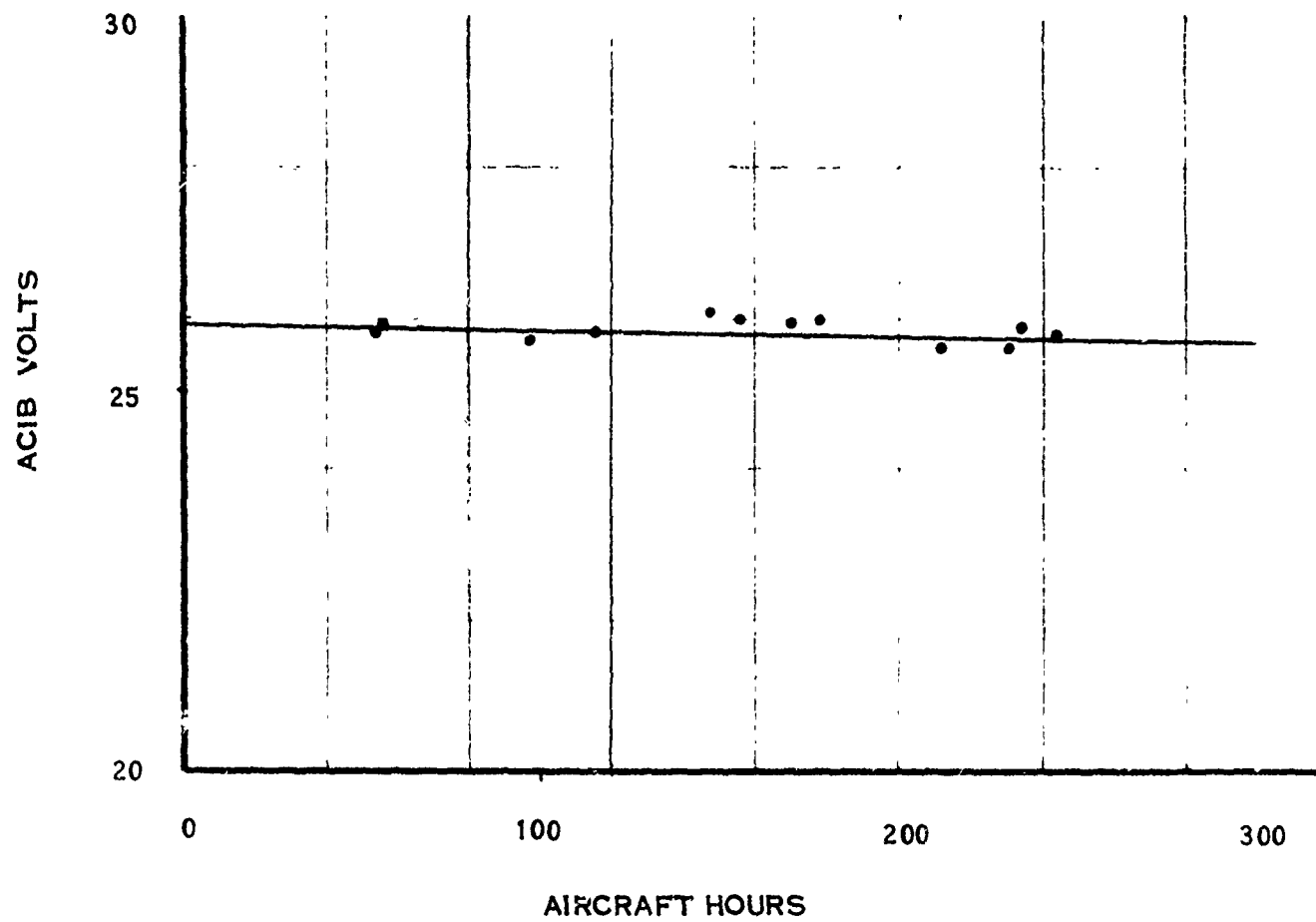


FIGURE 6-21 TREND OF DC ESSENTIAL BUS VOLTAGE

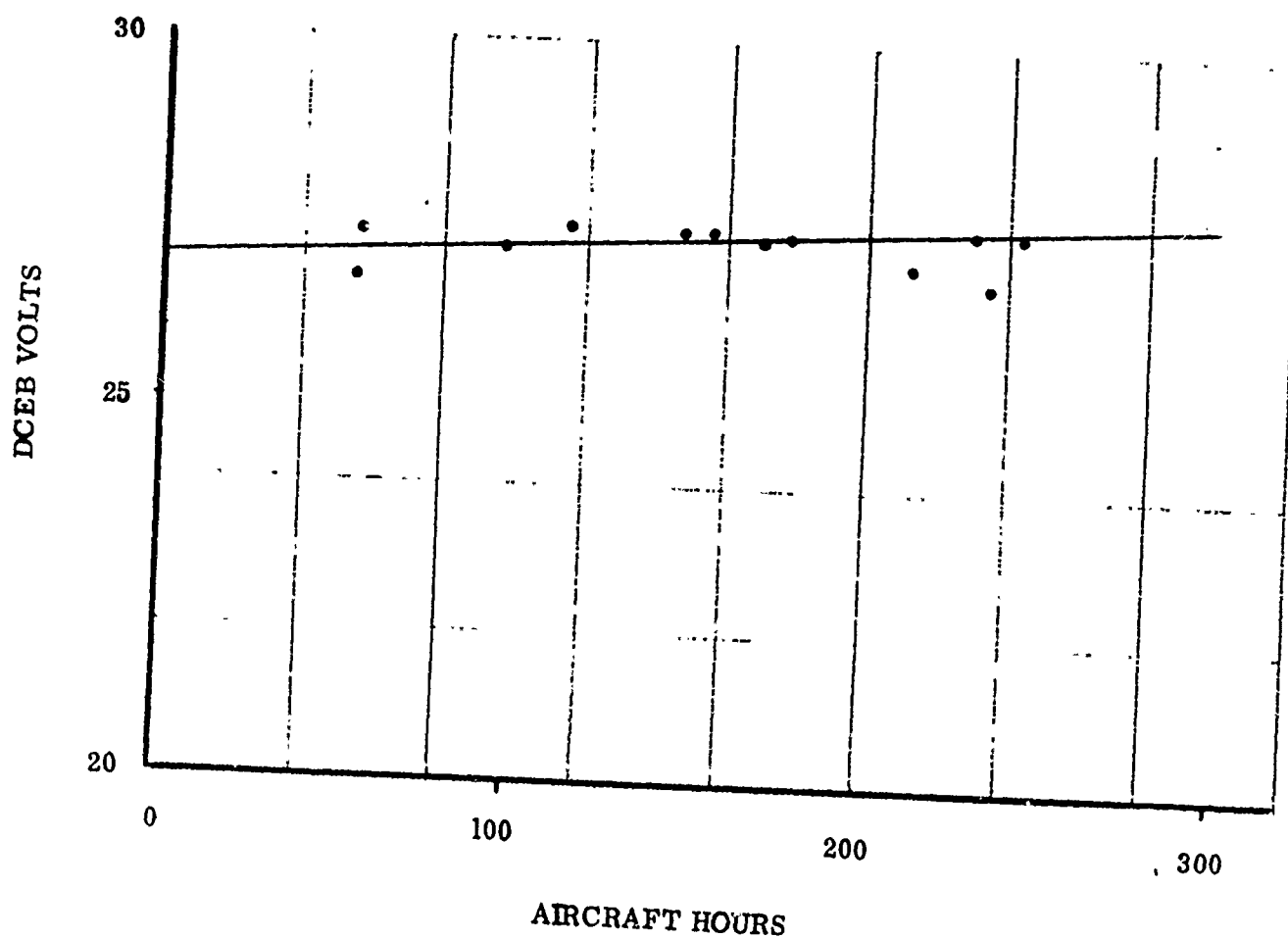


FIGURE 6-22 TREND OF HYDRAULIC PUMP LEAKAGE FLOW

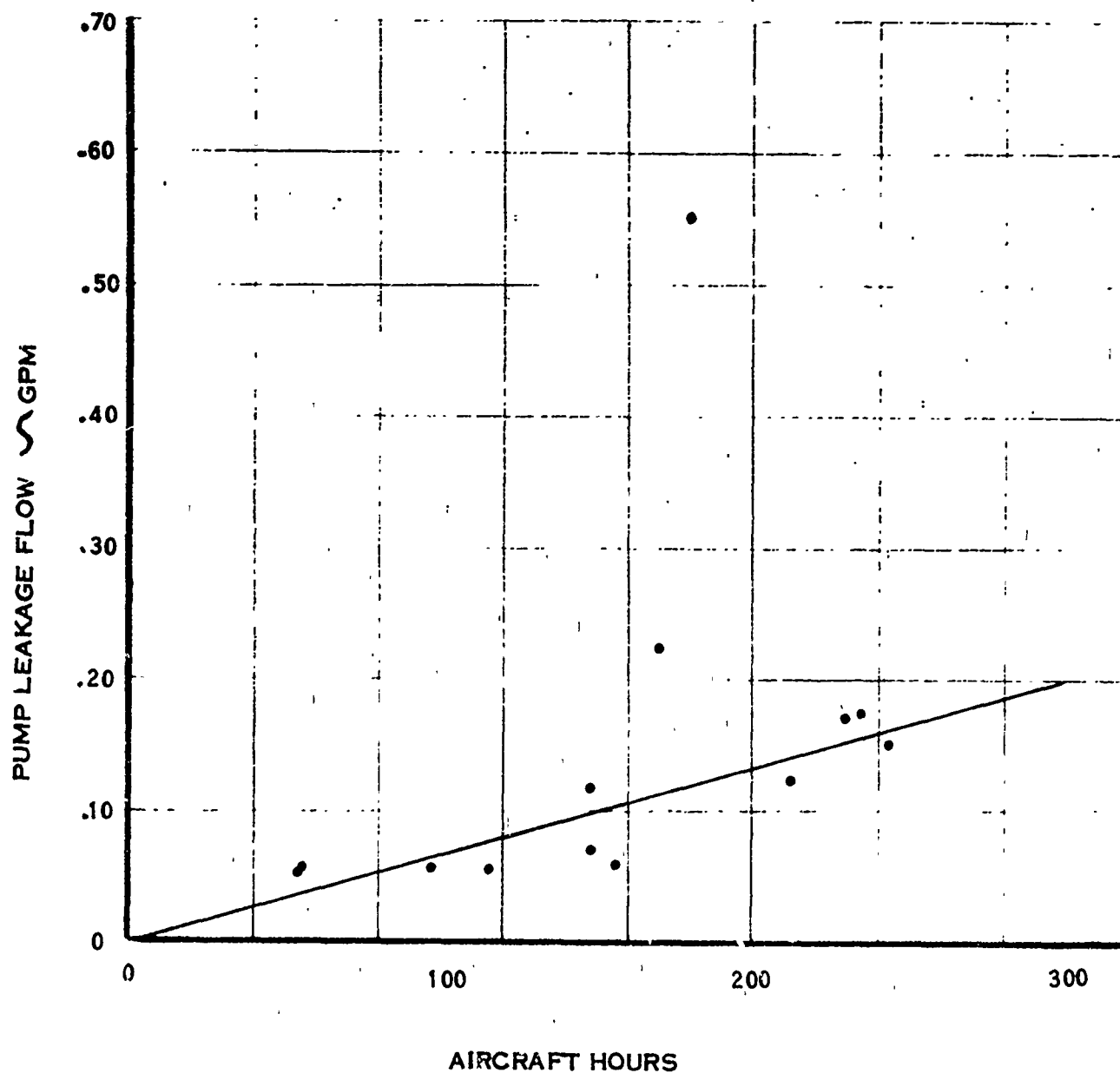


FIGURE 6-23 TREND OF HYDRAULIC PUMP TEMPERATURE RISE

HYDRAULIC PUMP  $\Delta T$

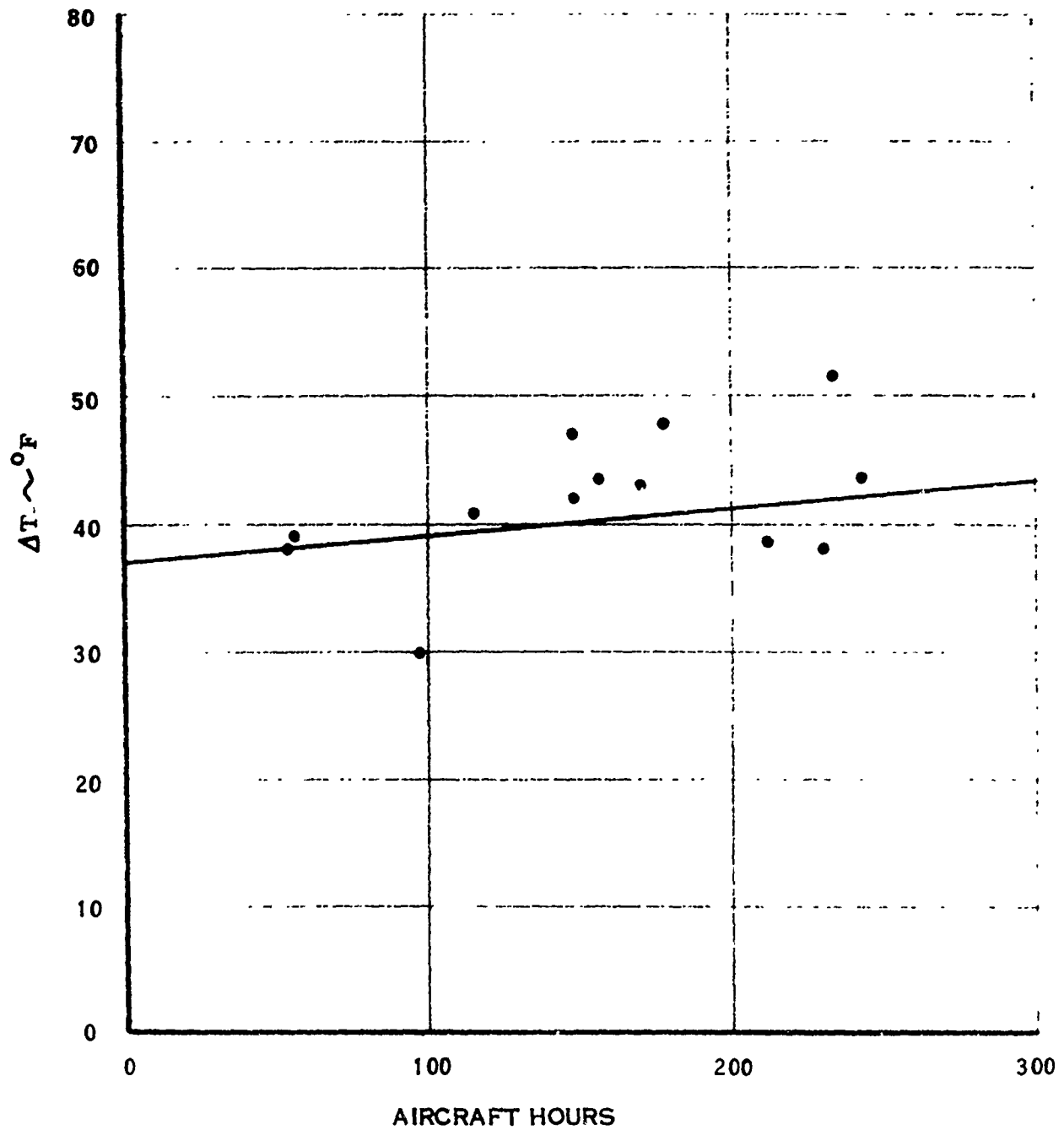


FIGURE 6-24 TREND OF HYDRAULIC SUPPLY PRESSURE

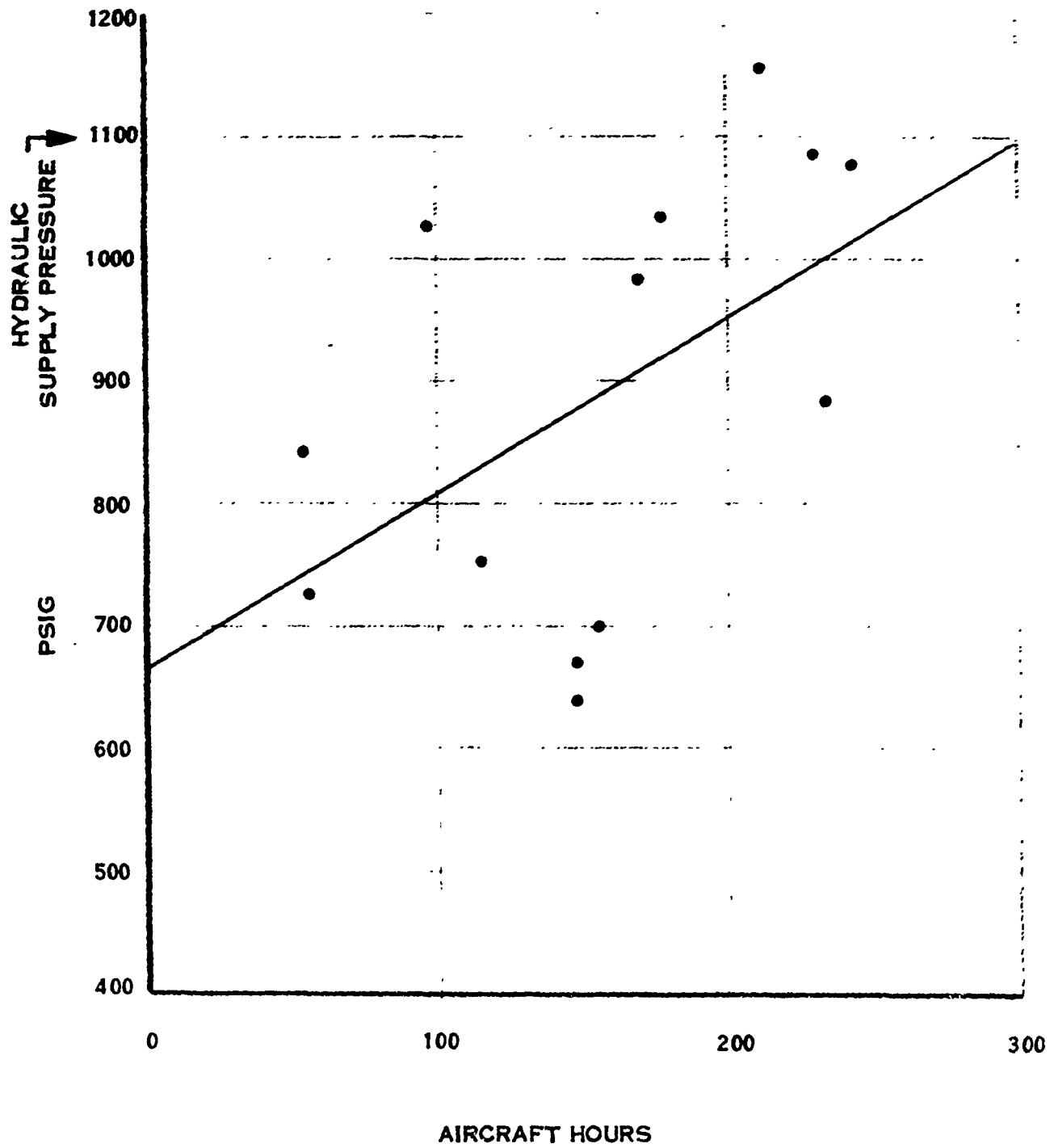


FIGURE 6-25 TREND OF FUEL PRESSURE

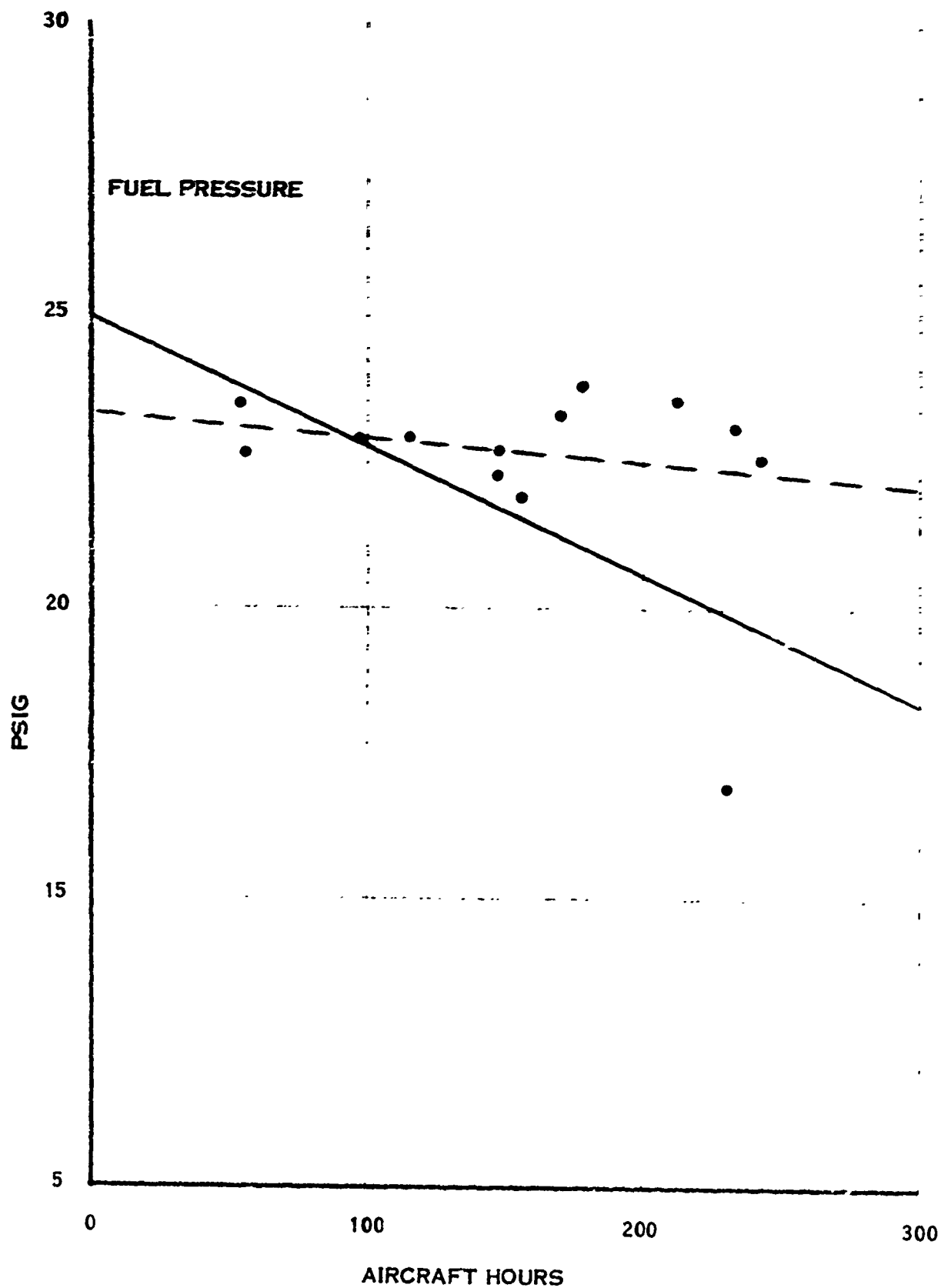




FIGURE 6-26 TREND OF TRANSMISSION OIL COOLER FLOW

OIL COOLER FLOW, TRANSMISSION

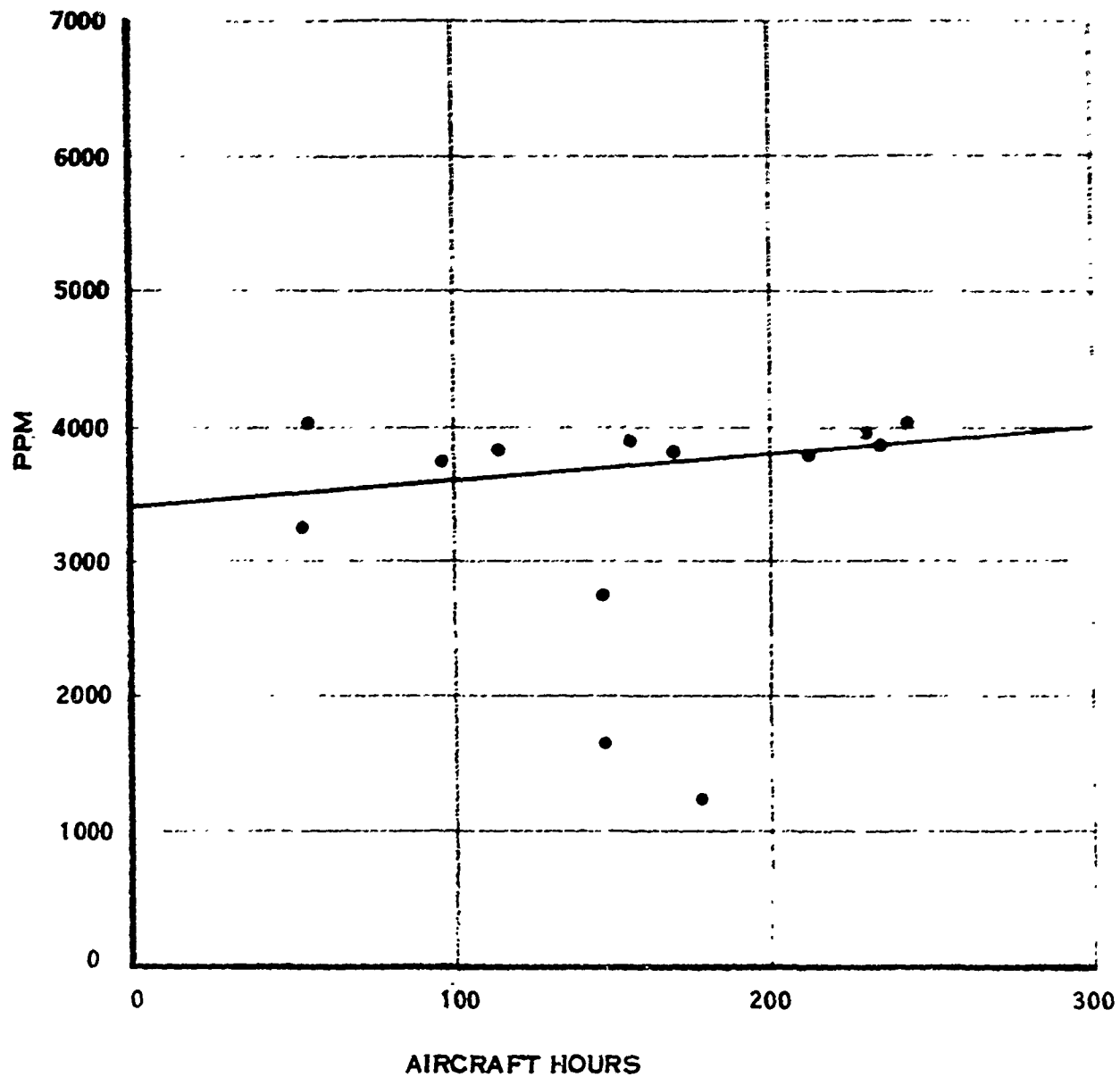


FIGURE 6-27 TREND OF TRANSMISSION OIL PRESSURE

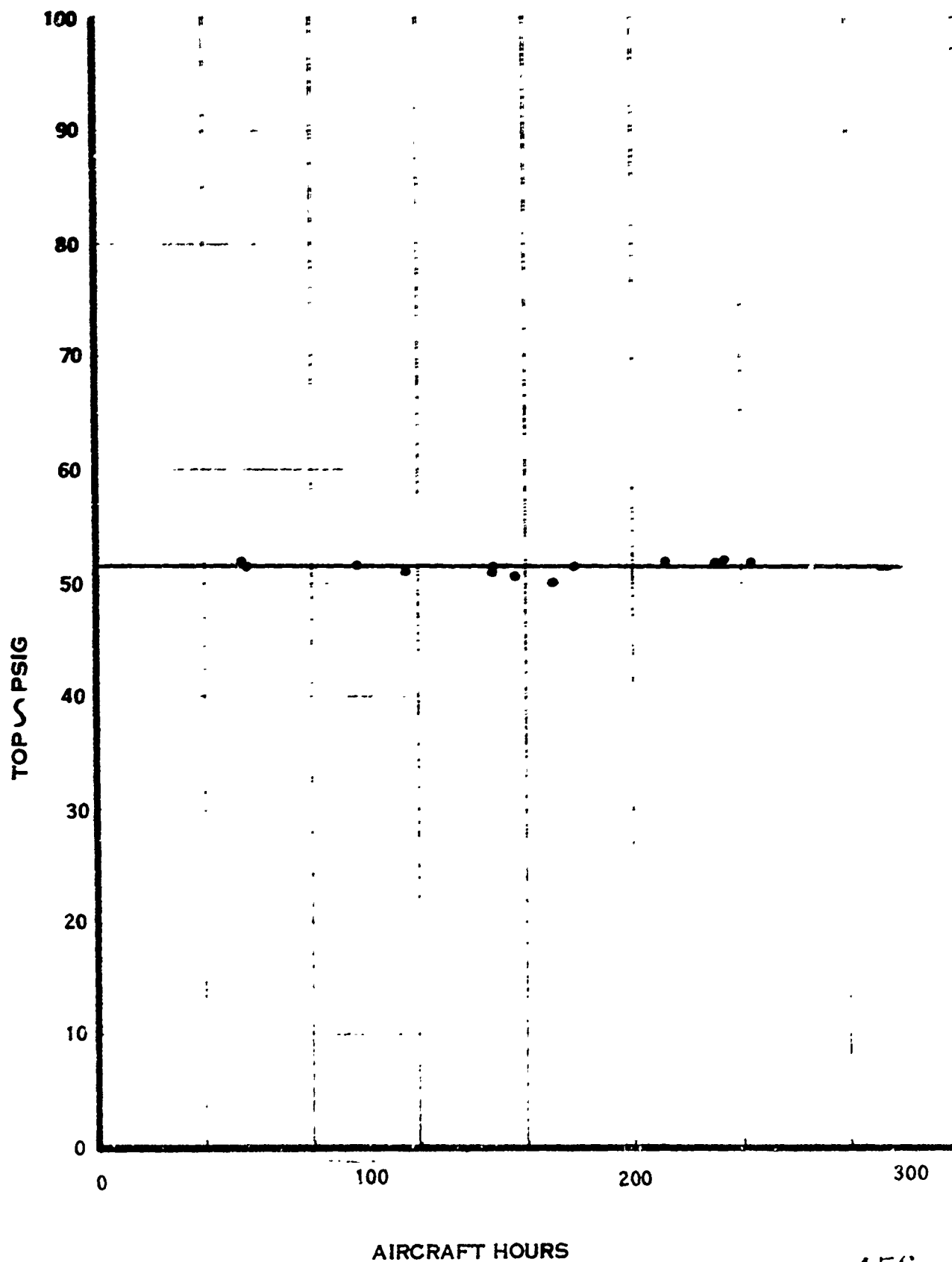


FIGURE 6-28

TREND OF ENGINE OIL PRESSURE

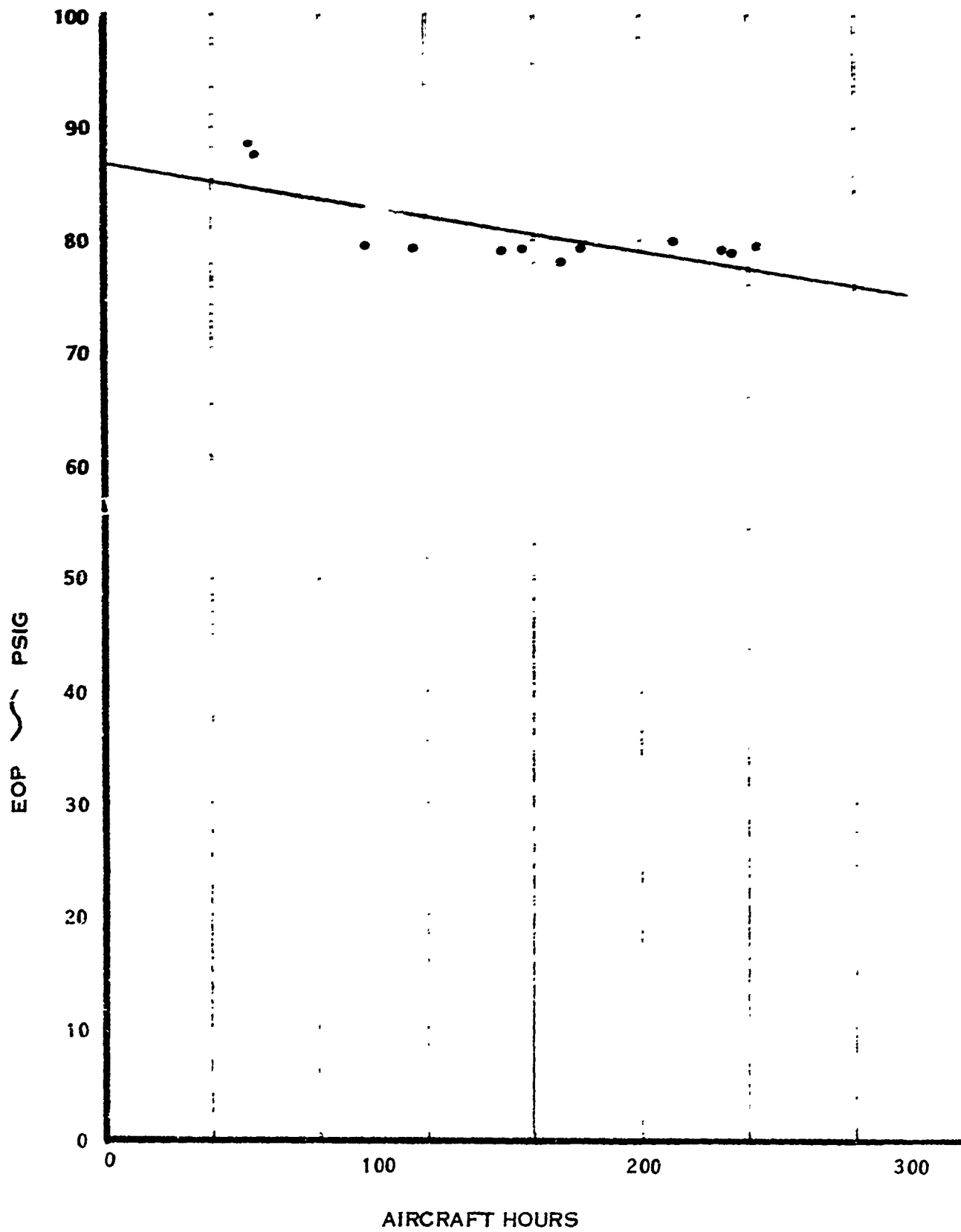


FIGURE 6-29 TREND OF BEARING 2 TEMPERATURE RISE

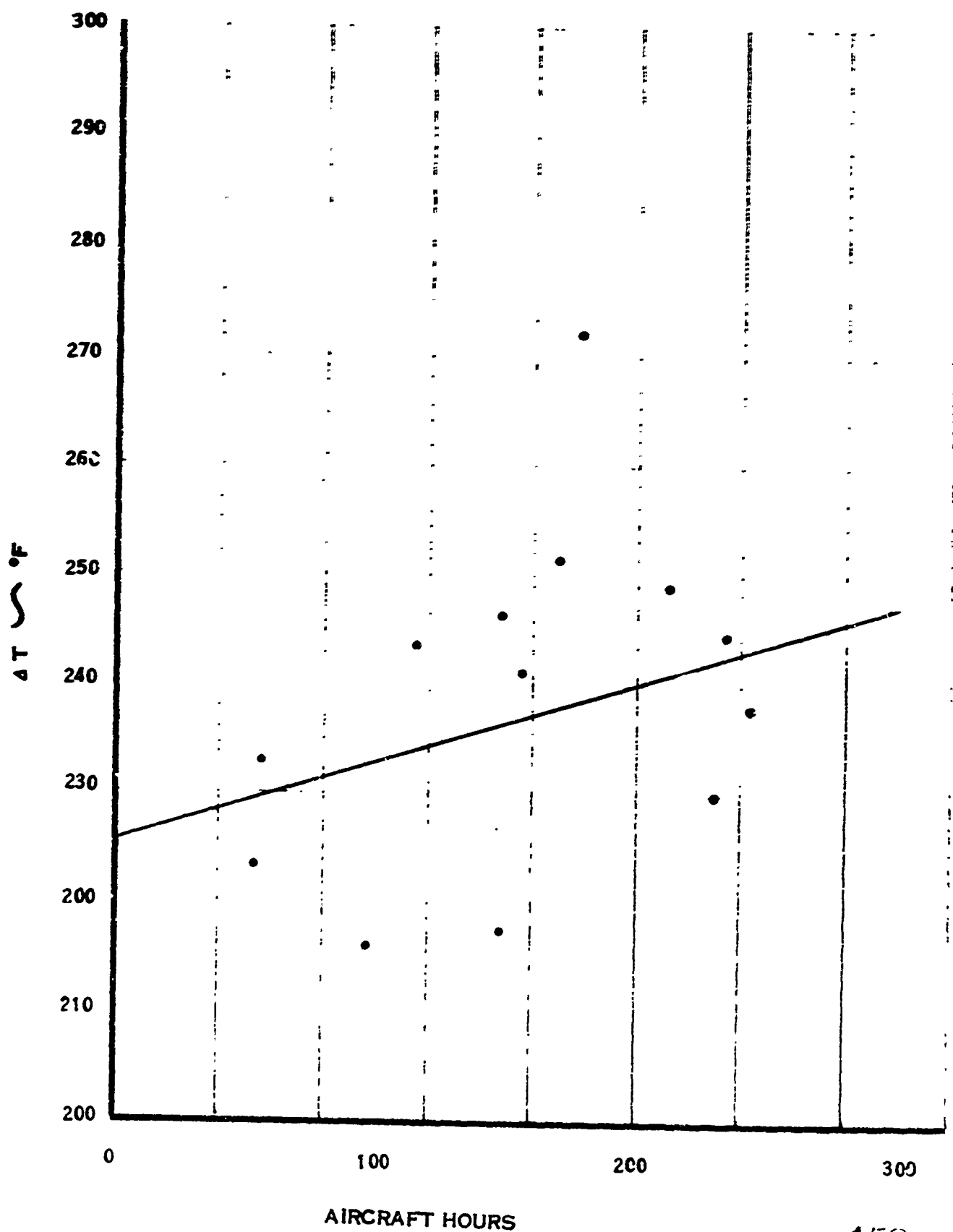


FIGURE 6-36 TREND OF BEARING 3 AND 4 TEMPERATURE RISE

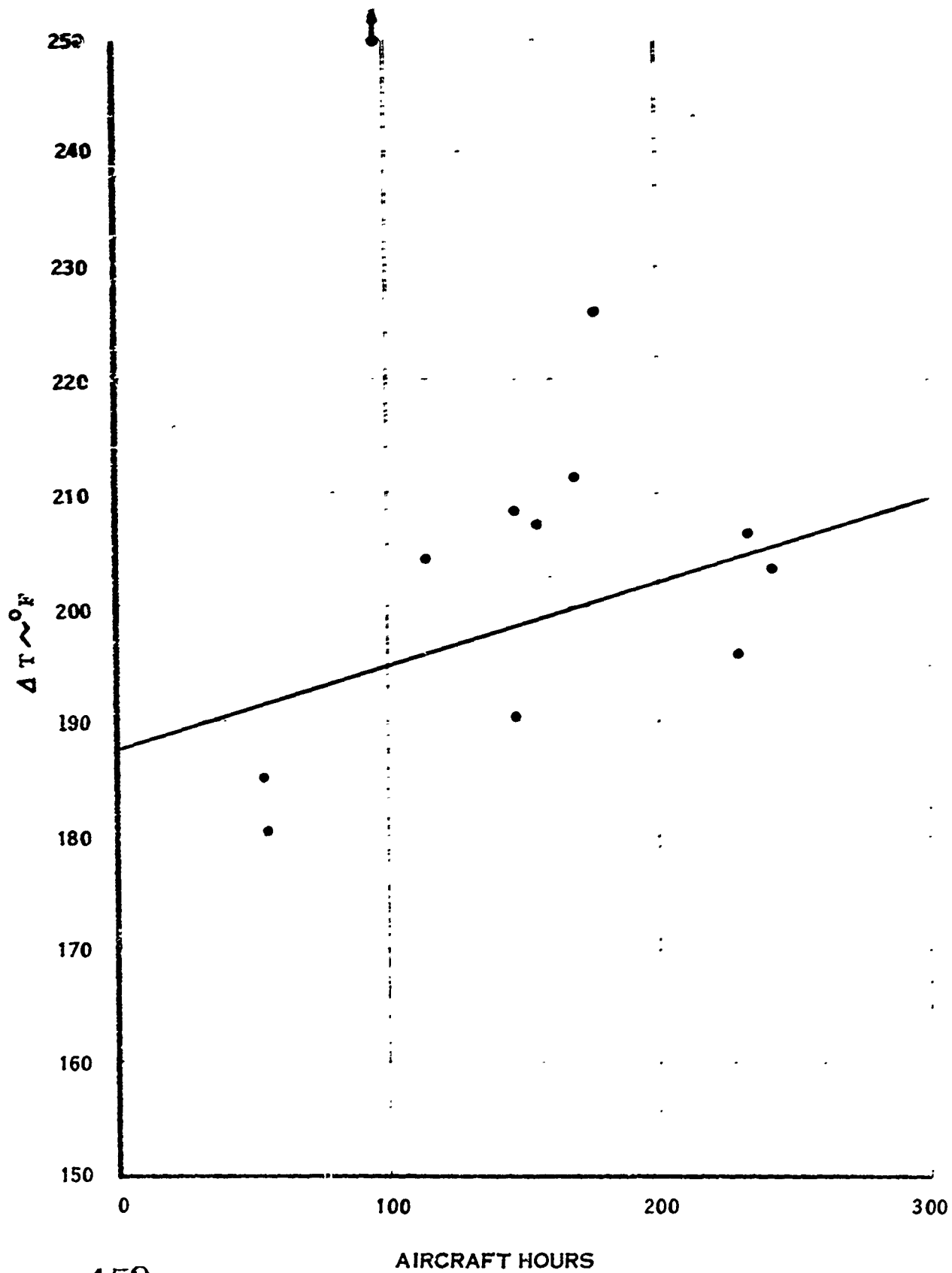


FIGURE 6-31 TREND OF 42° GEARBOX TEMPERATURE DIFFERENTIAL

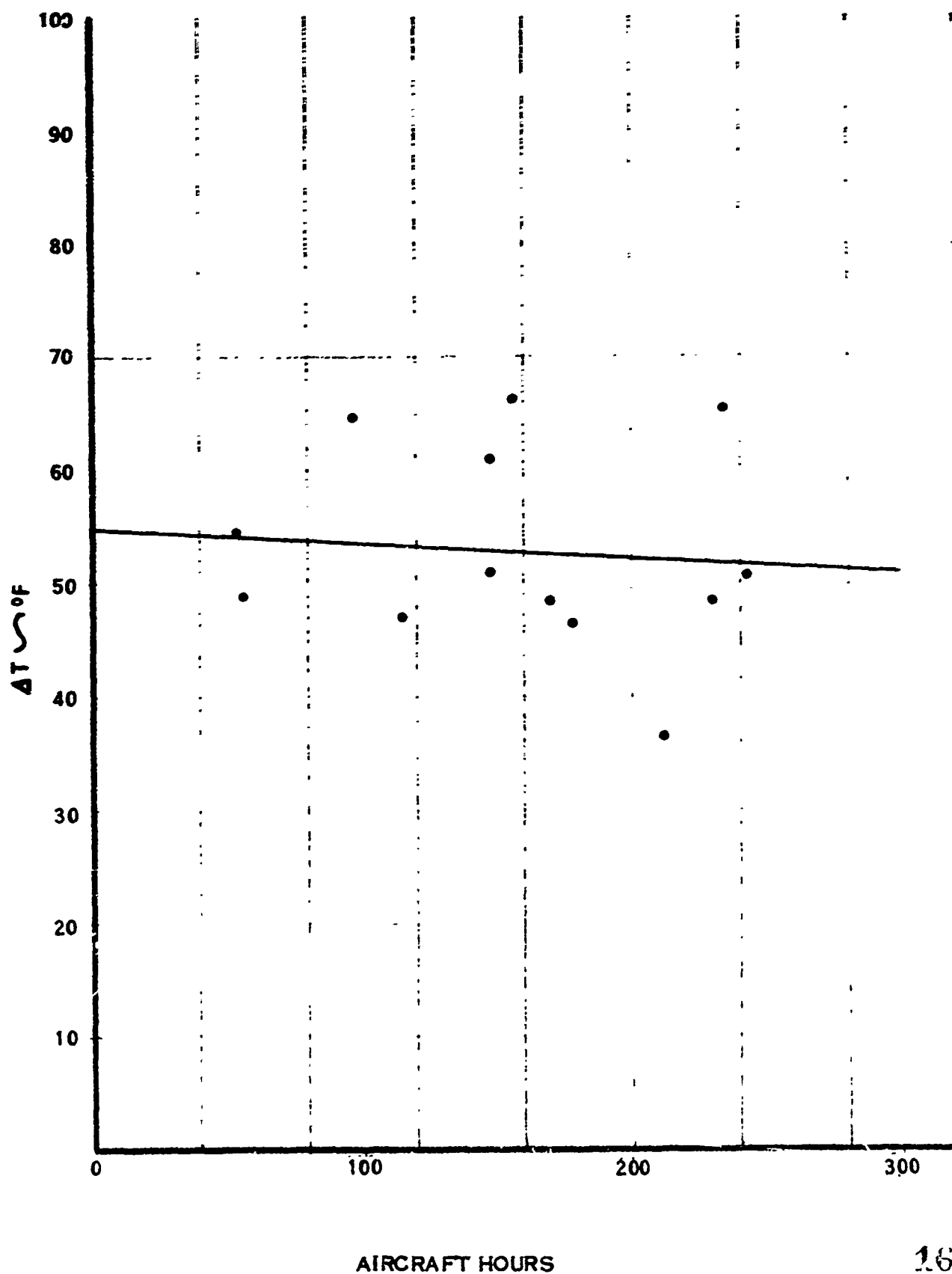
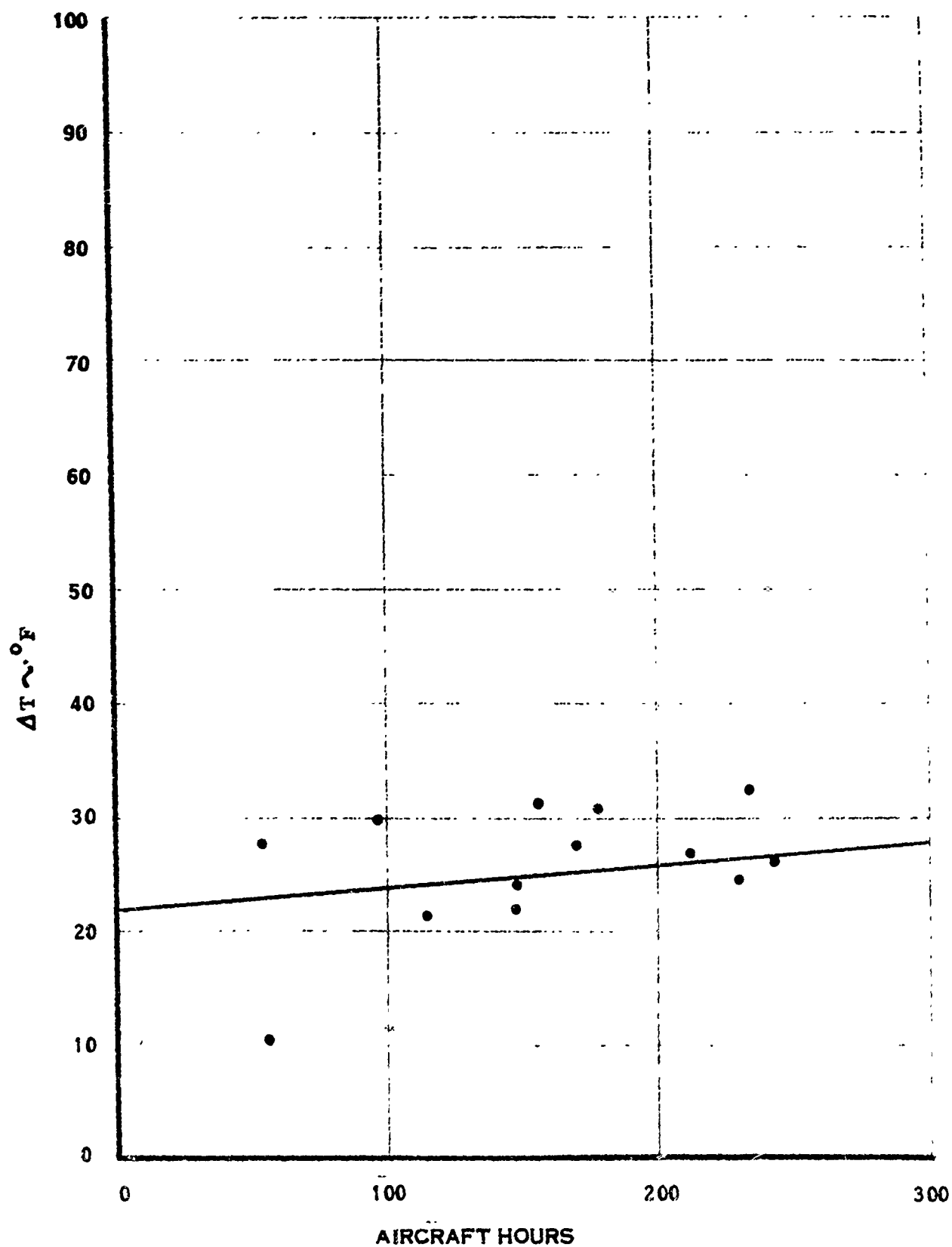


FIGURE 6-32 TREND OF 90° GEARBOX TEMPERATURE DIFFERENTIAL



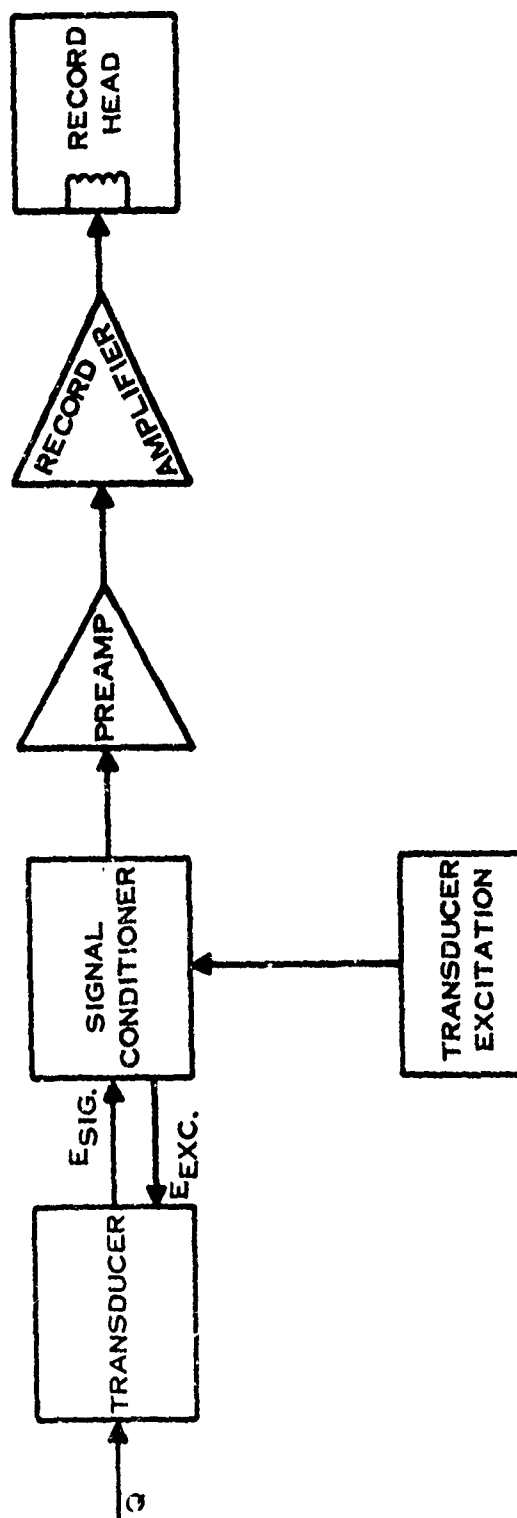


FIGURE 6-33 TAPE RECORD SYSTEM SIGNAL BLOCK DIAGRAM



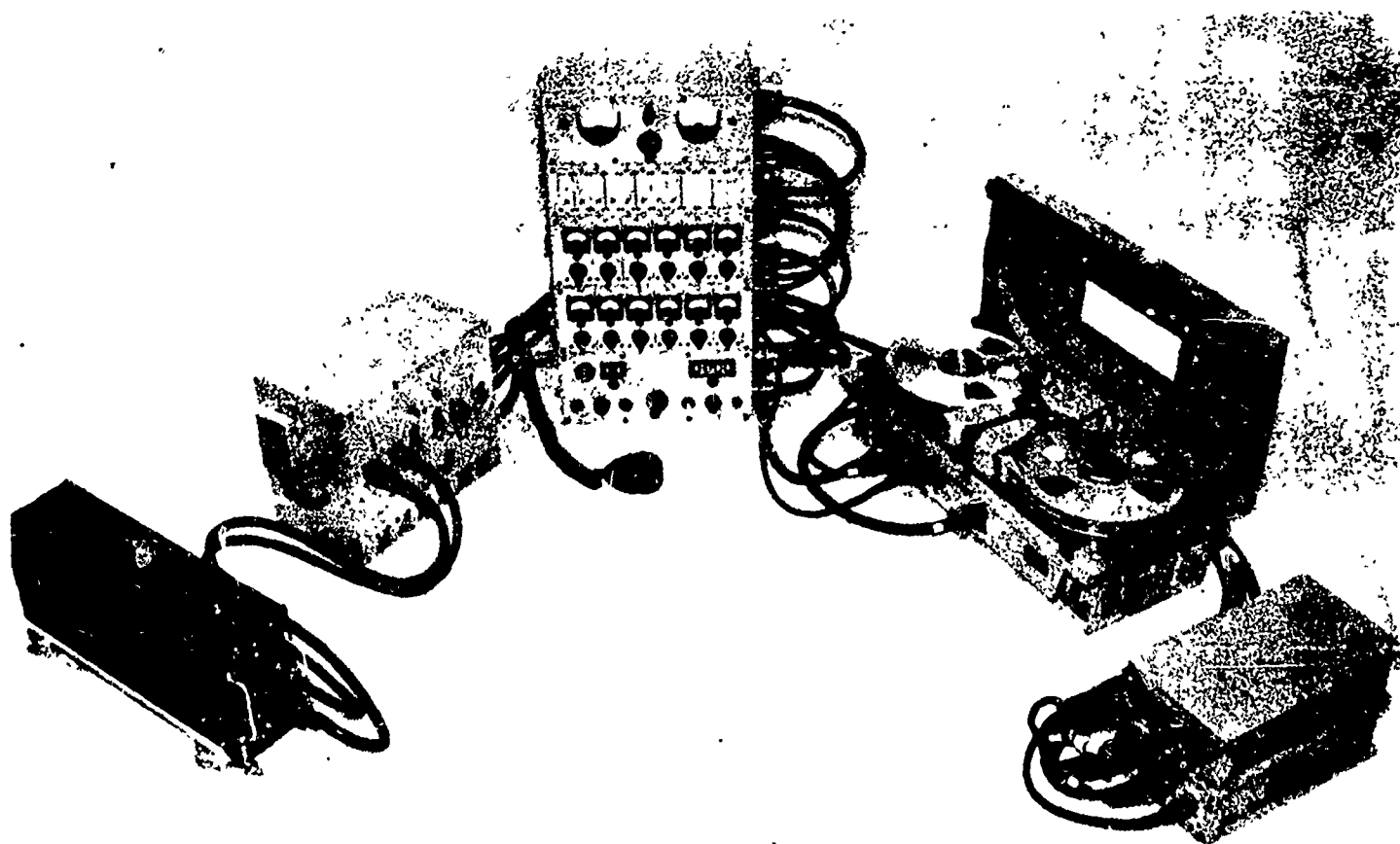


FIGURE 6-34 AR-200 TAPE RECORDING SYSTEM

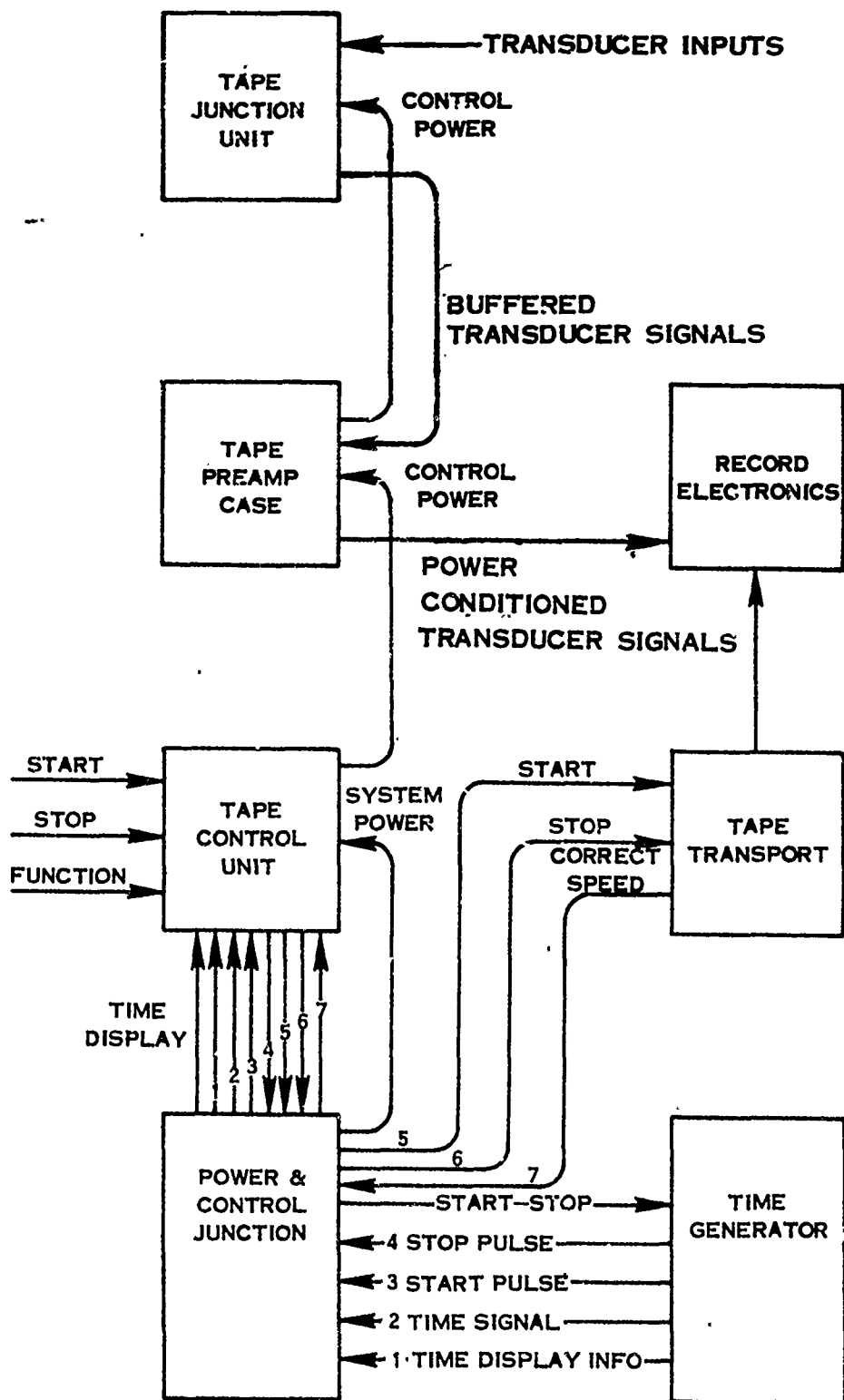


FIGURE 6-35 TAPE RECORD SYSTEM CONTROL  
BLOCK DIAGRAM - MODEL AR-200

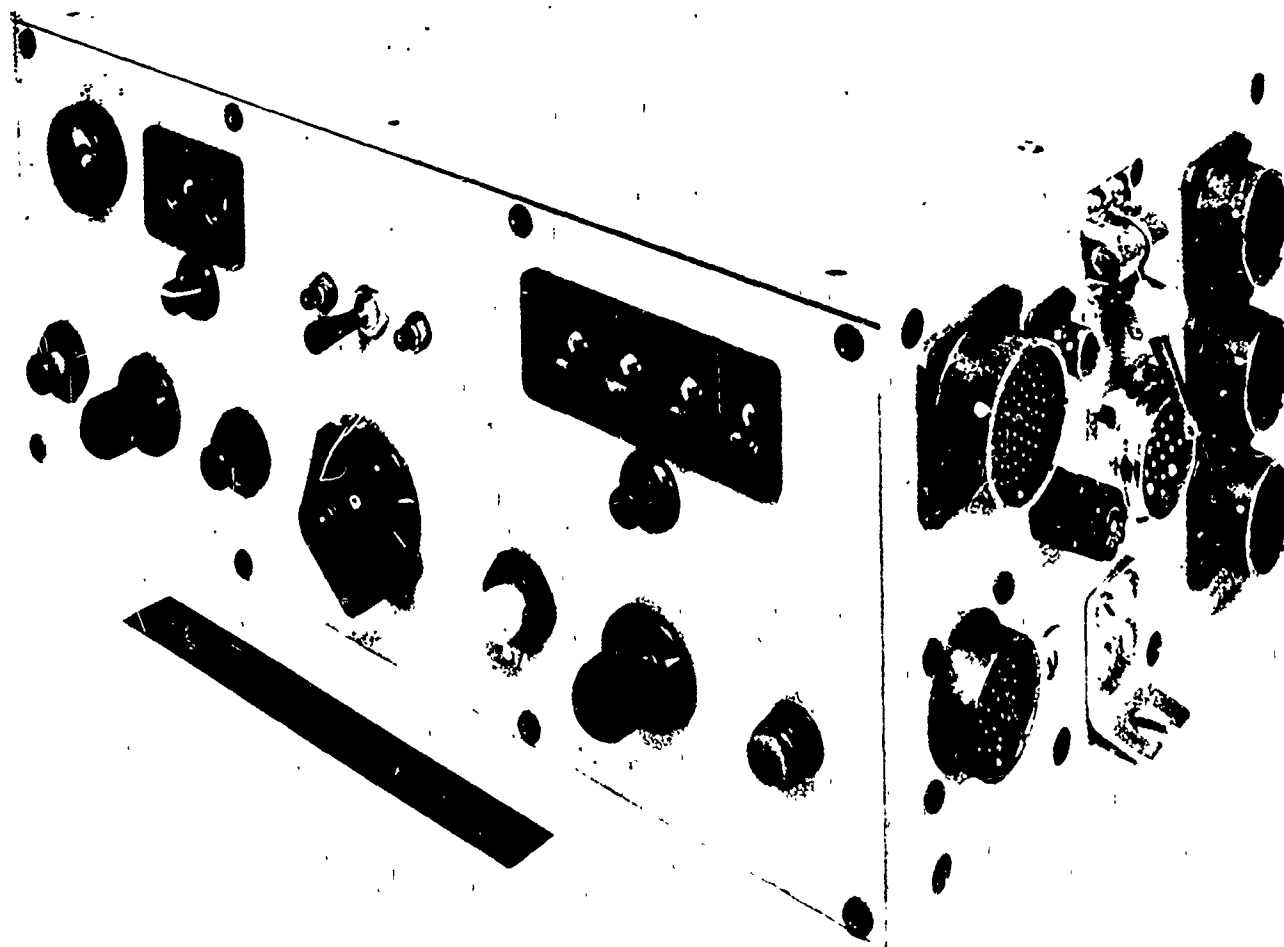


FIGURE 6-36 TAPE CONTROL UNIT

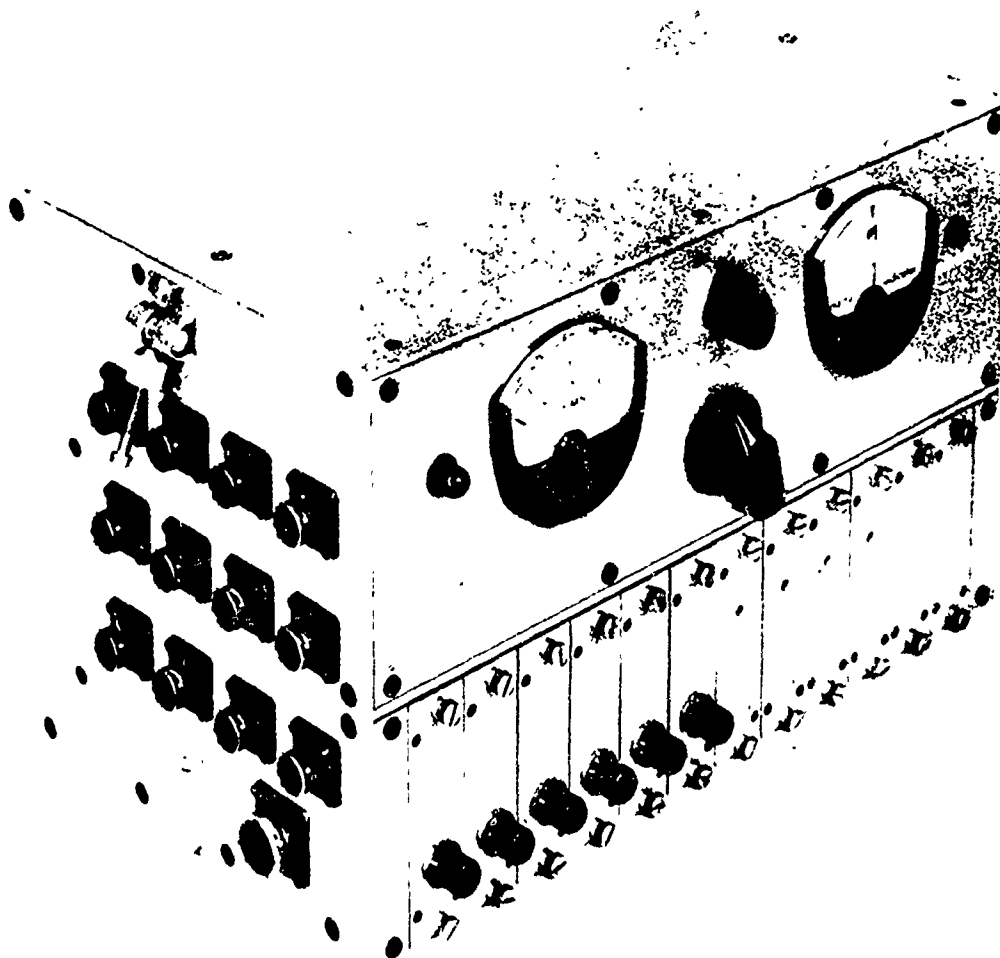


FIGURE 6-37 TAPE JUNCTION UNIT

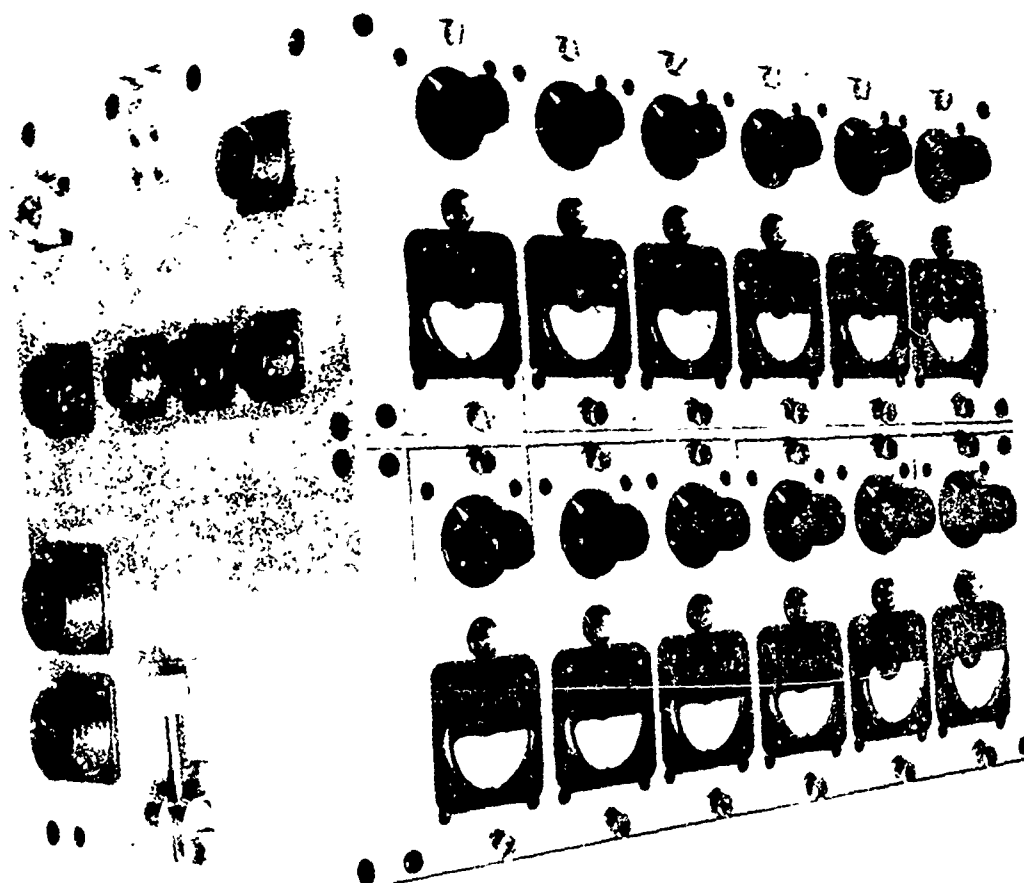


FIGURE 6-38 TAPE PREAMP CASE

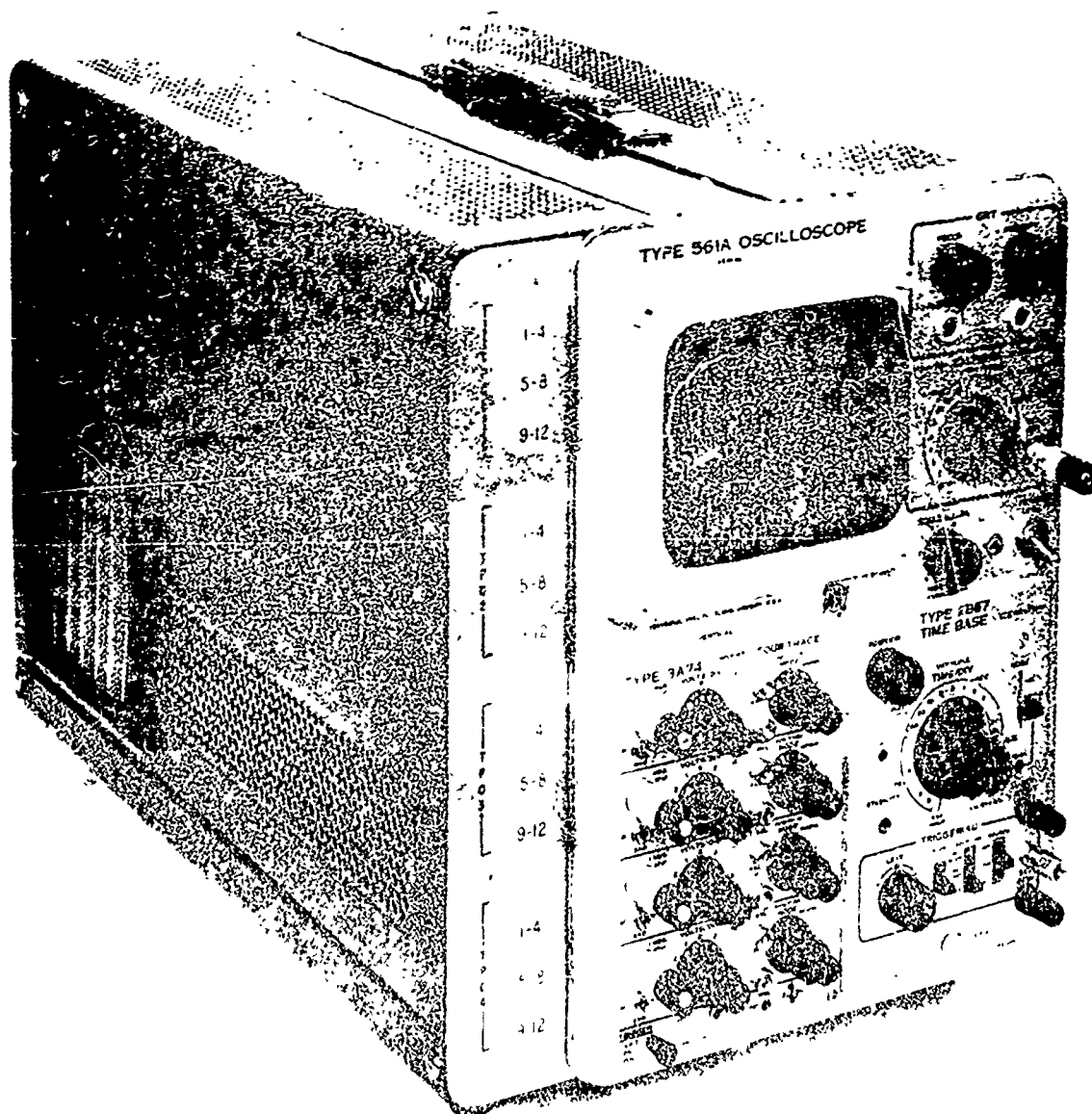


FIGURE C-3 MONITOR SCOPE.

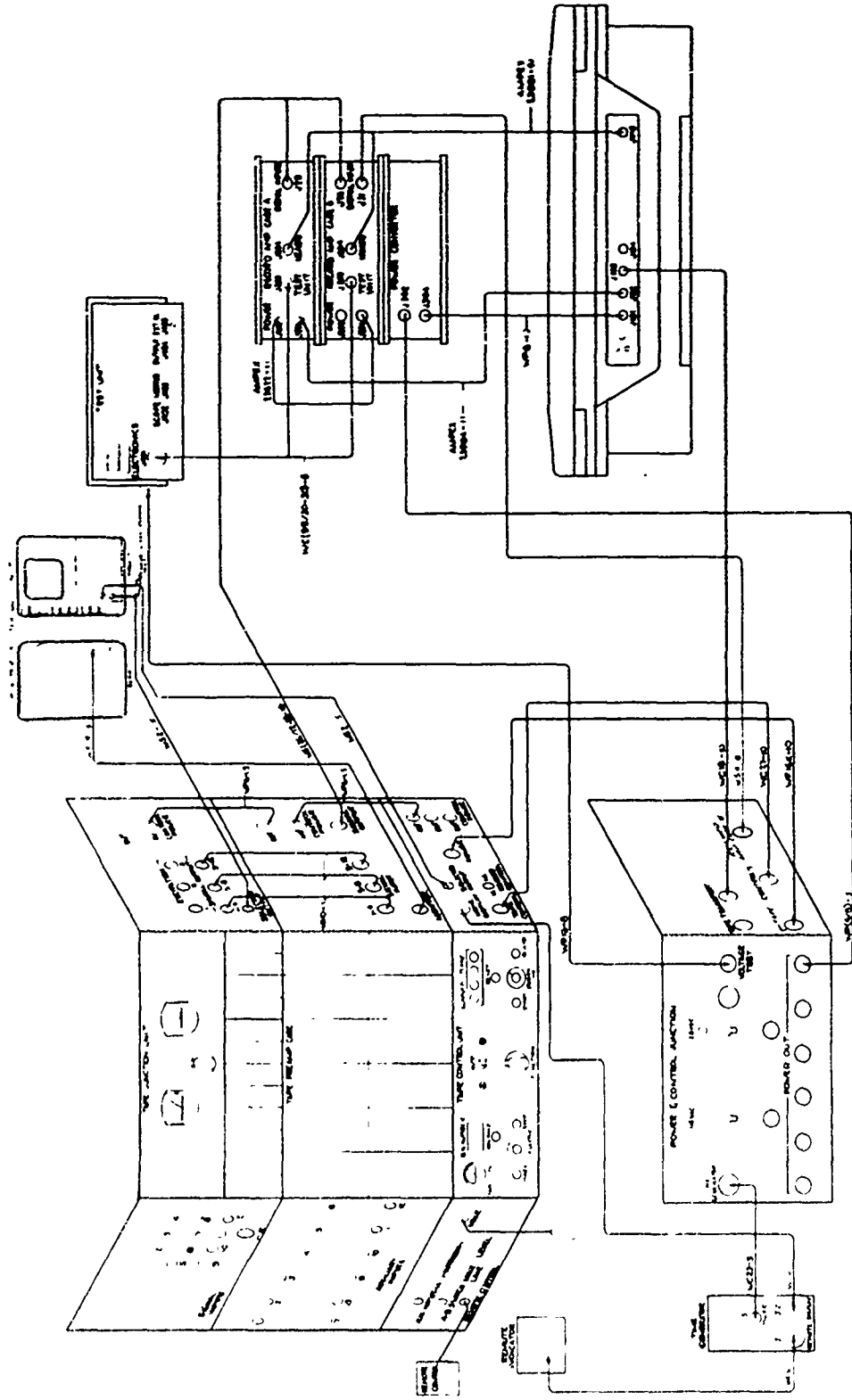


FIGURE 6-40 TAPE RECORD SYSTEM MODEL AR-200  
CABLE INTERCONNECTIONS

FIGURE 6-40 TAPE RECORD SYSTEM MODEL AR-200  
CABLE INTERCONNECTIONS

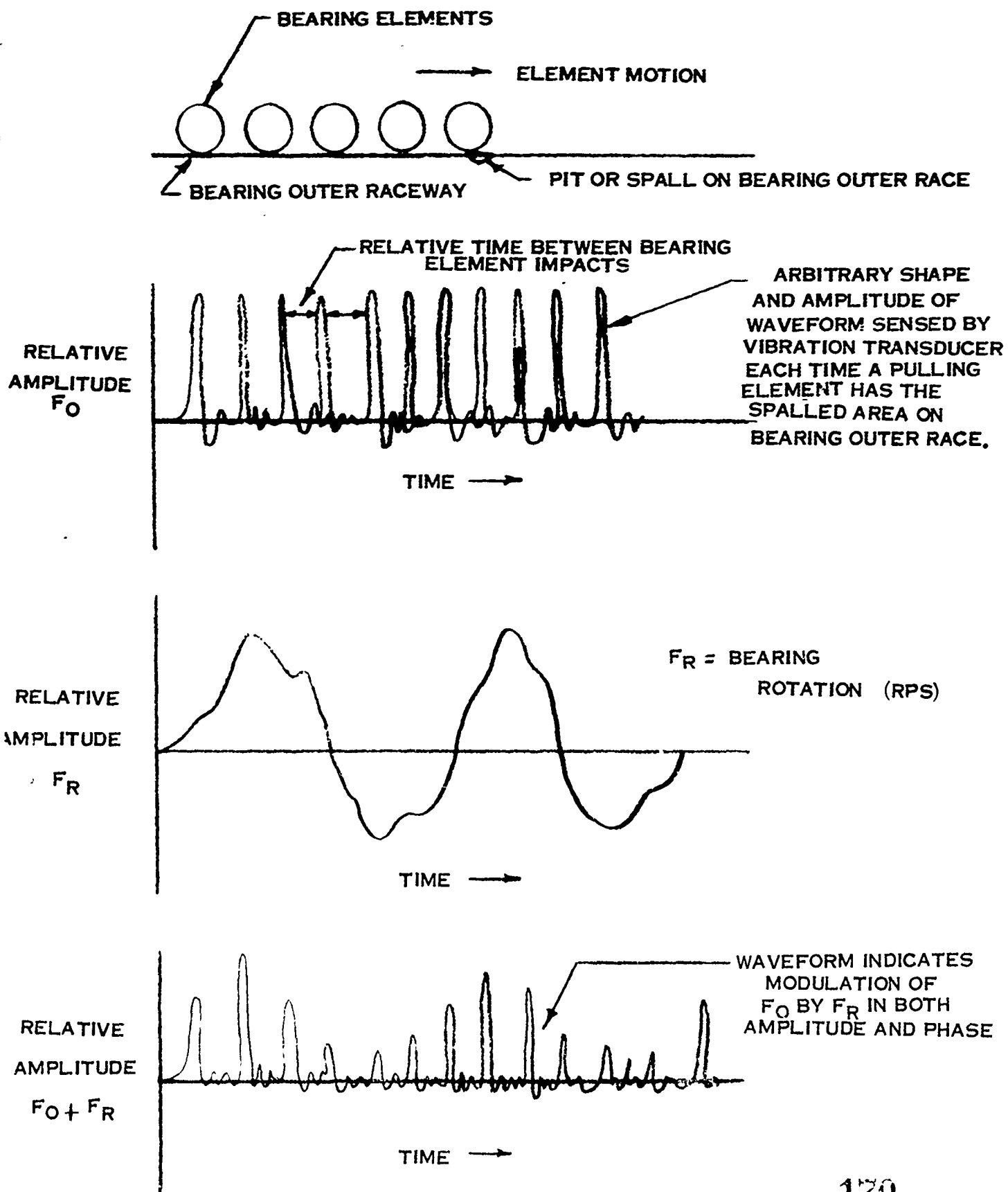


FIGURE 6-41 WAVEFORMS, BEARING PIT FREQUENCIES



420 Gearbox Bearings  
+72 Hz. Sidebands  
Band # 1st Harm. Band # 2nd Harm.

85	1224	217	3168
90	1296	222	3240
94	1368	227	3312
99	1440	232	3384
104	1512	237	3456
109	1584	242	3528
114	1656	247	3600
119	1728	252	3672
124	1800	257	3744
129	1872	262	3816
134	1944	267	3888
139	2016	271	3960
144	2088	276	4032
149	2160	281	4104
153	2232	286	4176
158	2304	291	4248
163	2376	296	4320
168	2448	301	4392
173	2520	306	4464
178	2592	311	4536
183	2664	316	4608

O-5KC bands

90° Gearbox Bearings and Harmonics  
+72 Hz Sidebands  
Band # 1st Harm. Band # 2nd Harm. Band # 3rd Harm. Band # 4th Harm.

26	360	99	1440	173	2520	247	3600
30	432	104	1512	178	2592	252	3672
35	504	109	1584	183	2664	257	3744
40	576	114	1656	188	2736	262	3816
45	648	119	1728	193	2808	267	3888
50	720	124	1800	198	2880	271	3960
55	792	129	1872	203	2952	276	4032
60	864	134	1944	207	3024	281	4104
65	936	139	2016	212	3096	286	4176
70	1008	144	2088	217	3168	291	4248
75	1080	149	2160	222	3240	296	4320
80	1152	153	2232	227	3312	301	4392
85	1224	158	2304	232	3384	306	4464
89	1296	163	2376	237	3456	311	4536
94	1368	168	2448	242	3528	316	4608
99	1440	173	2520	247	3600	321	4680
104	1512	178	2592	252	3672	325	4752
109	1584	183	2664	257	3744	330	4824
114	1656	188	2736	262	3816	335	4896
119	1728	193	2808	267	3888	340	4968
124	1800	198	2880	271	3960	-	5040

+28 Hz Sidebands

56	800	129	1880	203	2960	277	4040
58	828	131	1908	205	2988	279	4068
60	856	133	1936	207	3016	281	4096
62	884	135	1964	209	3044	283	4124
63	912	137	1992	211	3072	285	4152
65	940	139	2020	213	3100	286	4180
67	968	141	2048	215	3128	288	4208
69	996	143	2076	217	3156	290	4236
71	1024	145	2104	219	3184	292	4264
73	1052	147	2132	220	3212	294	4292
75	1080	149	2160	222	3240	296	4320
77	1108	151	2188	224	3268	298	4348
78	1136	152	2216	226	3296	300	4376
80	1164	154	2244	228	3324	302	4404
82	1192	156	2272	230	3352	304	4432
84	1220	158	2300	232	3380	306	4460
86	1248	160	2328	234	3408	307	4488
88	1276	162	2356	236	3436	309	4516
90	1304	164	2384	238	3464	311	4544
92	1332	166	2412	239	3492	313	4572
94	1360	168	2440	241	3520	315	4600

O-5KC Bands

FIGURE 6-42

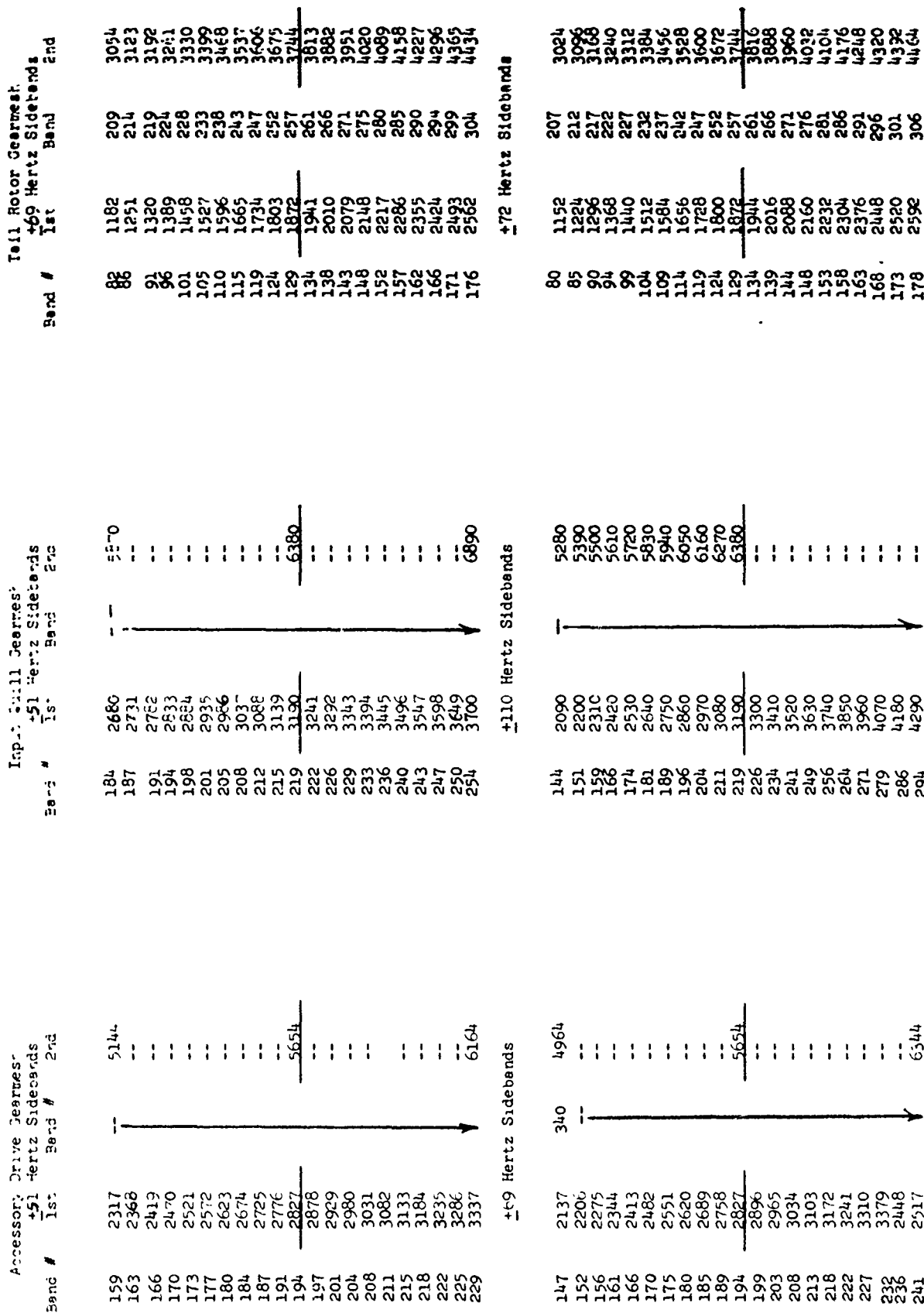


FIGURE 6-43A

Upper Planetary and Harmonic  
 -5 Hertz Sidebands  
 Band = 1st Harm. Band = 2nd Harm. Band = 3rd Harm. Band = 4th Harm. Band = 5th Harm. Band = 6th Harm. Band = 7th Harm.

Lower Planetary and Harmonic  
 -17 Hertz Sidebands  
 Band = 1st Harm. Band = 2nd Harm. Band = 3rd Harm.

Band	1st	2nd	3rd	4th	5th	6th	7th
41	132	129	172	214	313	377	443
42	131	128	171	213	312	376	442
43	130	127	170	212	311	375	441
44	129	126	169	211	310	374	440
45	128	125	168	210	309	373	439
46	127	124	167	209	308	372	438
47	126	123	166	208	307	371	437
48	125	122	165	207	306	370	436
49	124	121	164	206	305	369	435
50	123	120	163	205	304	368	434
51	122	119	162	204	303	367	433
52	121	118	161	203	302	366	432
53	120	117	160	202	301	365	431
54	119	116	159	201	300	364	430
55	118	115	158	200	299	363	429
56	117	114	157	199	298	362	428
57	116	113	156	198	297	361	427
58	115	112	155	197	296	360	426
59	114	111	154	196	295	359	425
60	113	110	153	195	294	358	424
61	112	109	152	194	293	357	423
62	111	108	151	193	292	356	422
63	110	107	150	192	291	355	421
64	109	106	149	191	290	354	420
65	108	105	148	190	289	353	419
66	107	104	147	189	288	352	418
67	106	103	146	188	287	351	417
68	105	102	145	187	286	350	416
69	104	101	144	186	285	349	415
70	103	100	143	185	284	348	414
71	102	99	142	184	283	347	413
72	101	98	141	183	282	346	412
73	100	97	140	182	281	345	411
74	99	96	139	181	280	344	410
75	98	95	138	180	279	343	409
76	97	94	137	179	278	342	408
77	96	93	136	178	277	341	407
78	95	92	135	177	276	340	406
79	94	91	134	176	275	339	405
80	93	90	133	175	274	338	404
81	92	89	132	174	273	337	403
82	91	88	131	173	272	336	402
83	90	87	130	172	271	335	401
84	89	86	129	171	270	334	400
85	88	85	128	170	269	333	399
86	87	84	127	169	268	332	398
87	86	83	126	168	267	331	397
88	85	82	125	167	266	330	396
89	84	81	124	166	265	329	395
90	83	80	123	165	264	328	394
91	82	79	122	164	263	327	393
92	81	78	121	163	262	326	392
93	80	77	120	162	261	325	391
94	79	76	119	161	260	324	390
95	78	75	118	160	259	323	389
96	77	74	117	159	258	322	388
97	76	73	116	158	257	321	387
98	75	72	115	157	256	320	386
99	74	71	114	156	255	319	385
100	73	70	113	155	254	318	384

41 Hertz Sidebands

41 Hertz Sidebands

Band	1st	2nd	3rd	4th	5th	6th	7th
33	112	121	173	234	303	377	431
34	111	120	172	233	302	376	430
35	110	119	171	232	301	375	429
36	109	118	170	231	300	374	428
37	108	117	169	230	299	373	427
38	107	116	168	229	298	372	426
39	106	115	167	228	297	371	425
40	105	114	166	227	296	370	424
41	104	113	165	226	295	369	423
42	103	112	164	225	294	368	422
43	102	111	163	224	293	367	421
44	101	110	162	223	292	366	420
45	100	109	161	222	291	365	419
46	99	108	160	221	290	364	418
47	98	107	159	220	289	363	417
48	97	106	158	219	288	362	416
49	96	105	157	218	287	361	415
50	95	104	156	217	286	360	414
51	94	103	155	216	285	359	413
52	93	102	154	215	284	358	412
53	92	101	153	214	283	357	411
54	91	100	152	213	282	356	410
55	90	99	151	212	281	355	409
56	89	98	150	211	280	354	408
57	88	97	149	210	279	353	407
58	87	96	148	209	278	352	406
59	86	95	147	208	277	351	405
60	85	94	146	207	276	350	404
61	84	93	145	206	275	349	403
62	83	92	144	205	274	348	402
63	82	91	143	204	273	347	401
64	81	90	142	203	272	346	400
65	80	89	141	202	271	345	399
66	79	88	140	201	270	344	398
67	78	87	139	200	269	343	397
68	77	86	138	199	268	342	396
69	76	85	137	198	267	341	395
70	75	84	136	197	266	340	394
71	74	83	135	196	265	339	393
72	73	82	134	195	264	338	392
73	72	81	133	194	263	337	391
74	71	80	132	193	262	336	390
75	70	79	131	192	261	335	389
76	69	78	130	191	260	334	388
77	68	77	129	190	259	333	387
78	67	76	128	189	258	332	386
79	66	75	127	188	257	331	385
80	65	74	126	187	256	330	384
81	64	73	125	186	255	329	383
82	63	72	124	185	254	328	382
83	62	71	123	184	253	327	381
84	61	70	122	183	252	326	380
85	60	69	121	182	251	325	379
86	59	68	120	181	250	324	378
87	58	67	119	180	249	323	377
88	57	66	118	179	248	322	376
89	56	65	117	178	247	321	375
90	55	64	116	177	246	320	374
91	54	63	115	176	245	319	373
92	53	62	114	175	244	318	372
93	52	61	113	174	243	317	371
94	51	60	112	173	242	316	370
95	50	59	111	172	241	315	369
96	49	58	110	171	240	314	368
97	48	57	109	170	239	313	367
98	47	56	108	169	238	312	366
99	46	55	107	168	237	311	365
100	45	54	106	167	236	310	364

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FIGURE 6-43B

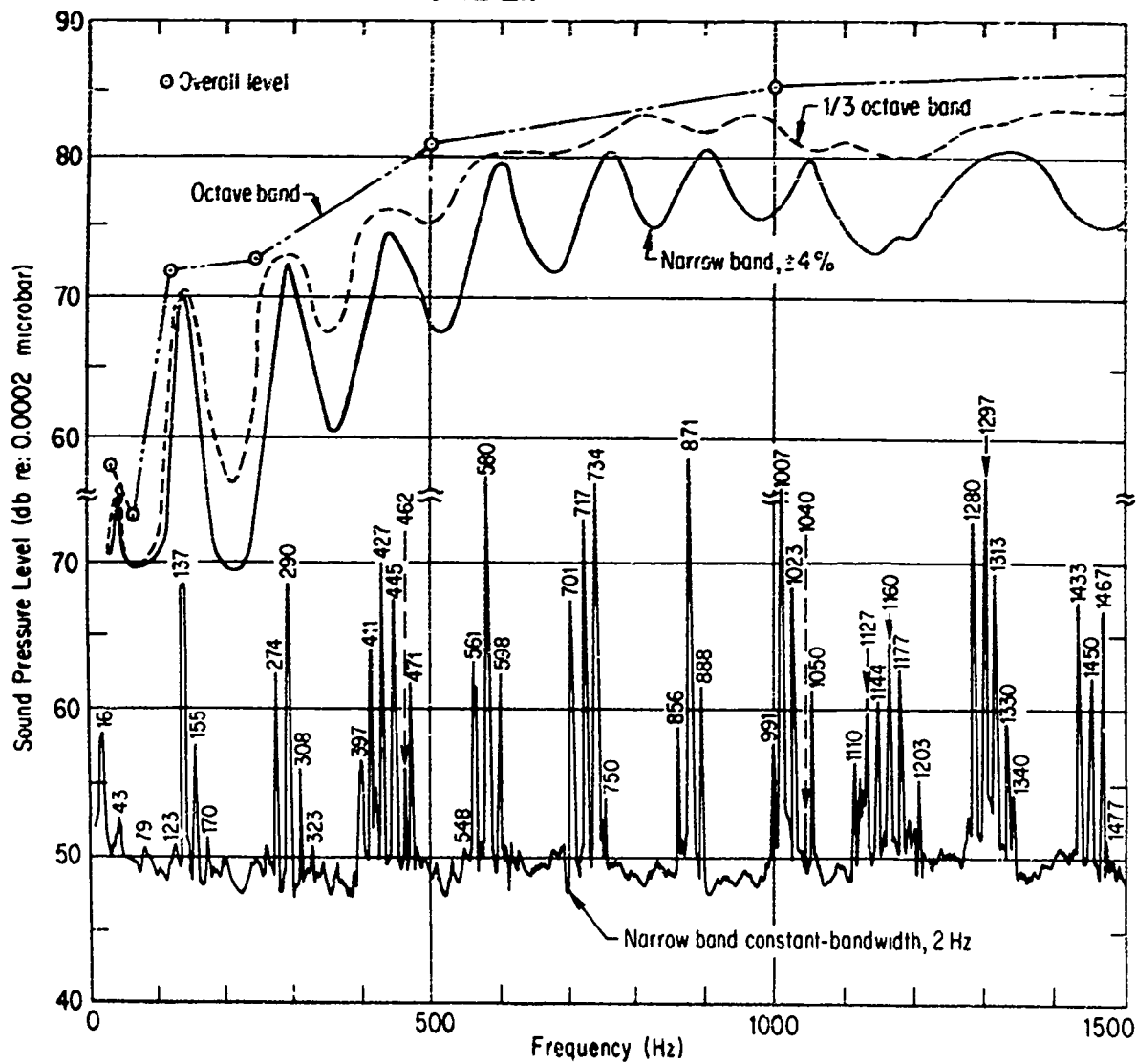


FIGURE 6-44

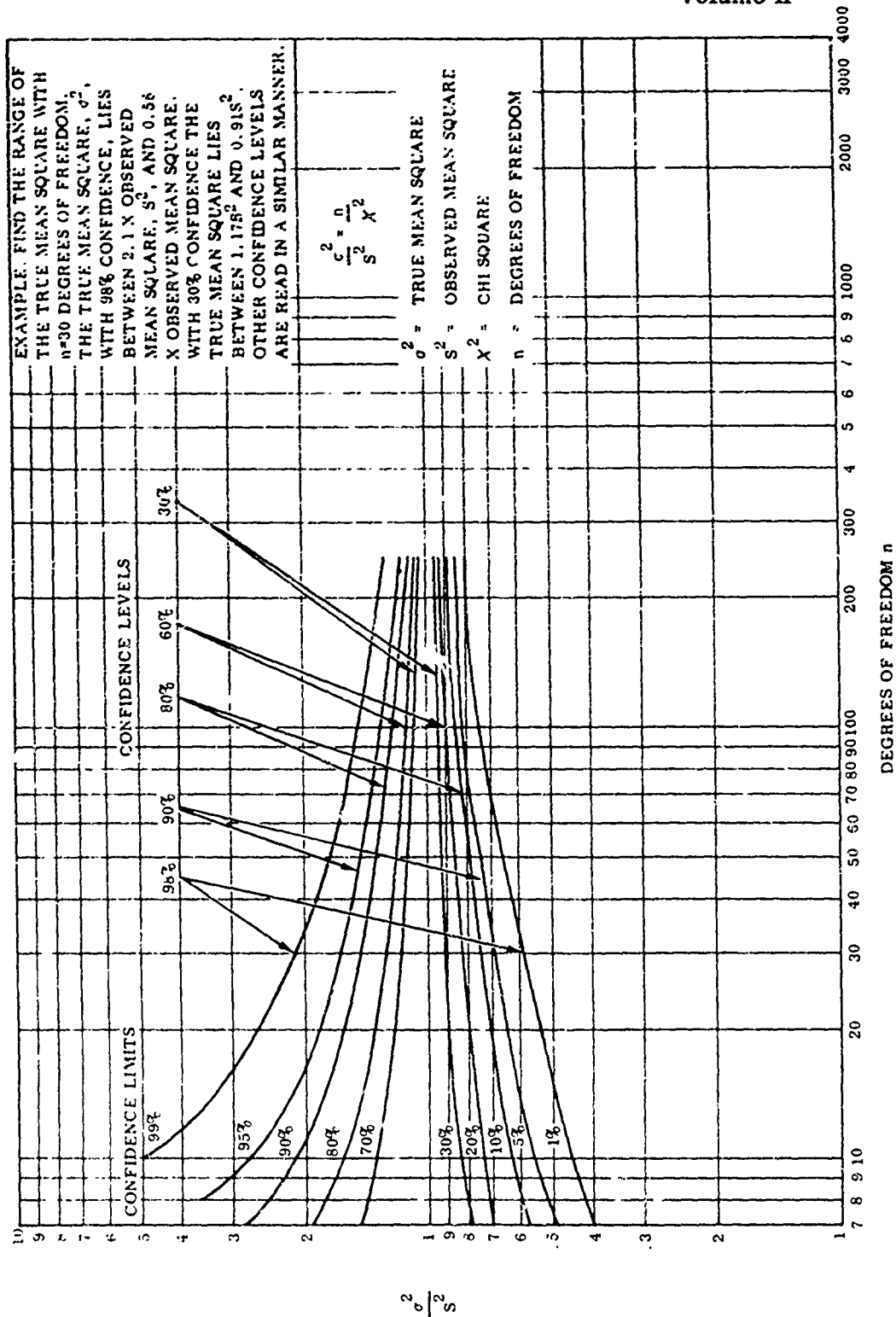


FIGURE 6-45 CHI-SQUARE DISTRIBUTION CHART

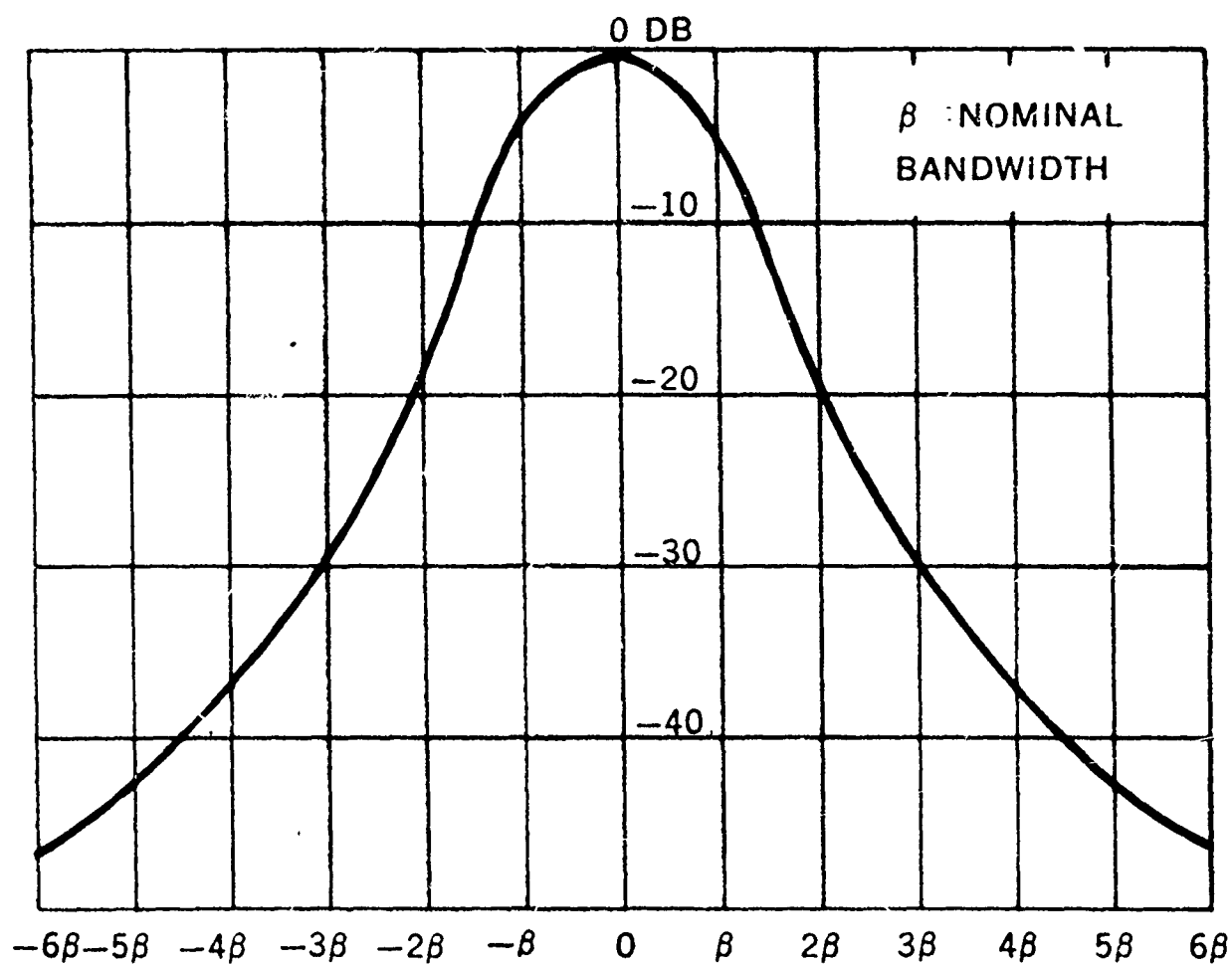
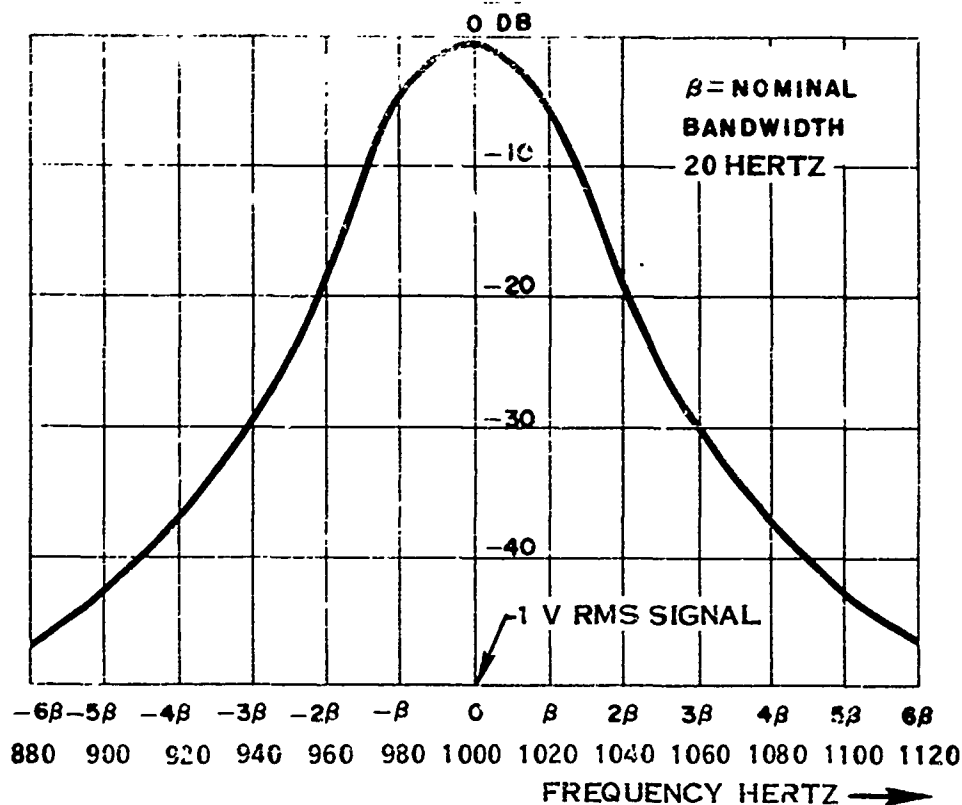
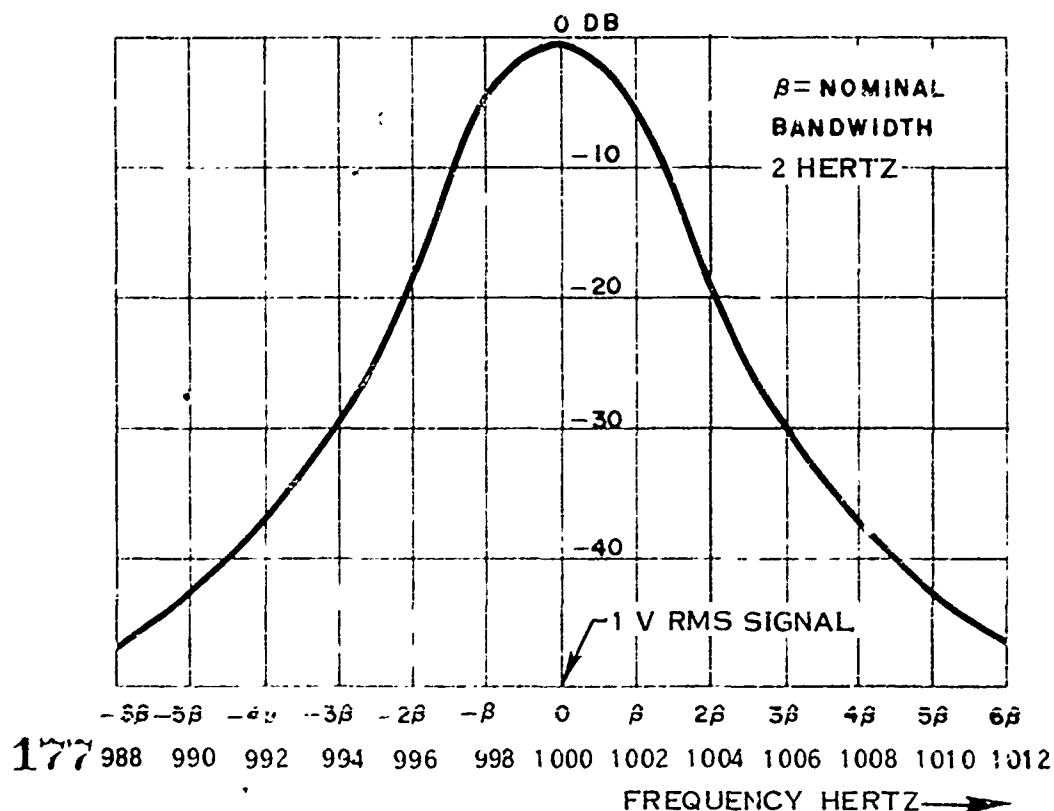


FIGURE 6-46 NORMALIZED SHAPE OF SPECTRAL ANALYSIS FILTER  
( DIGITALLY SYNTHESIZED )

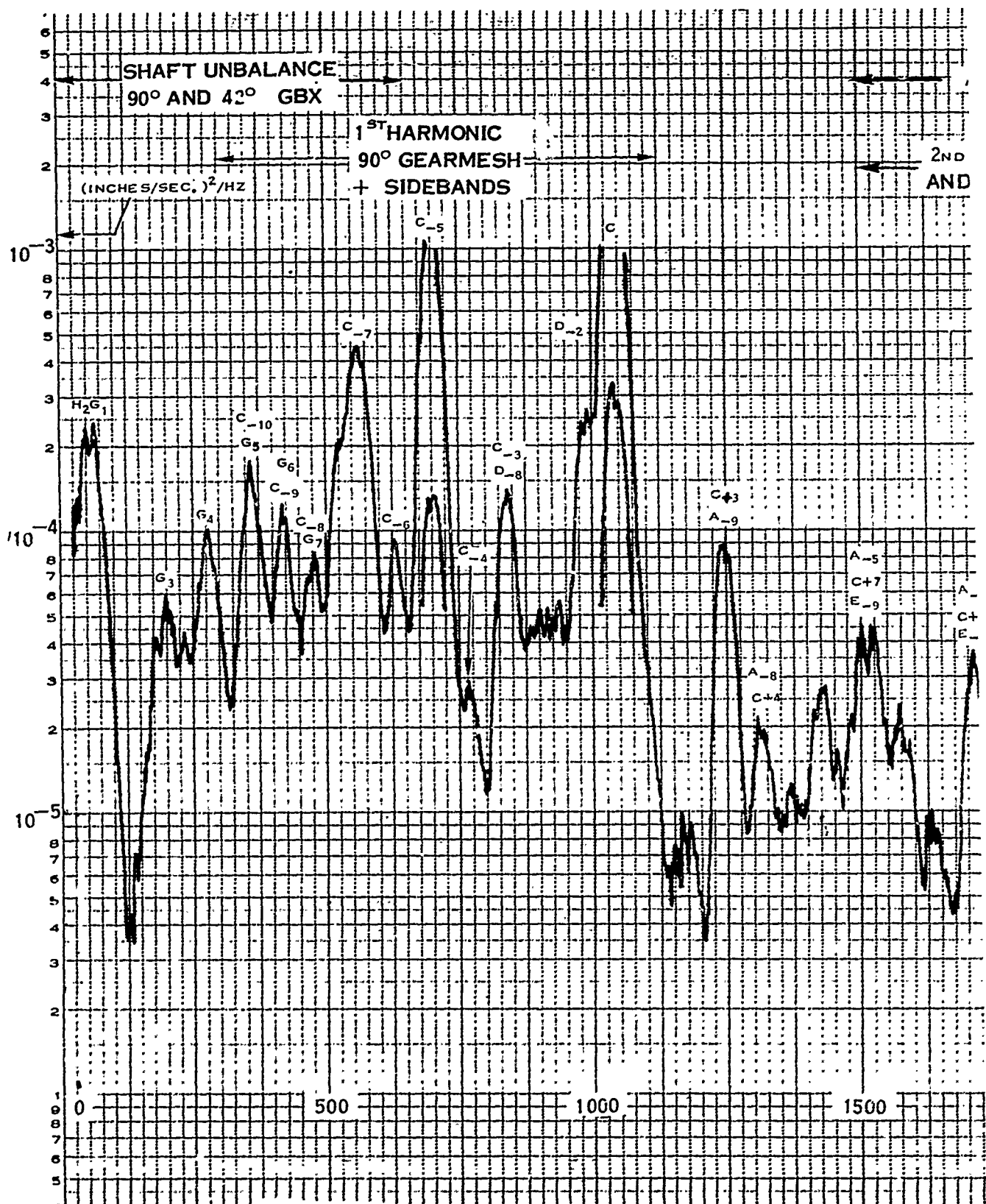


APPROXIMATELY 100 MV RMS OF THE 1 V RMS SIGNAL AT 1000 HZ (-20DB) WILL BE OBSERVED AT 960 HZ DUE TO THE ATTENUATION RATE OF THE FILTER



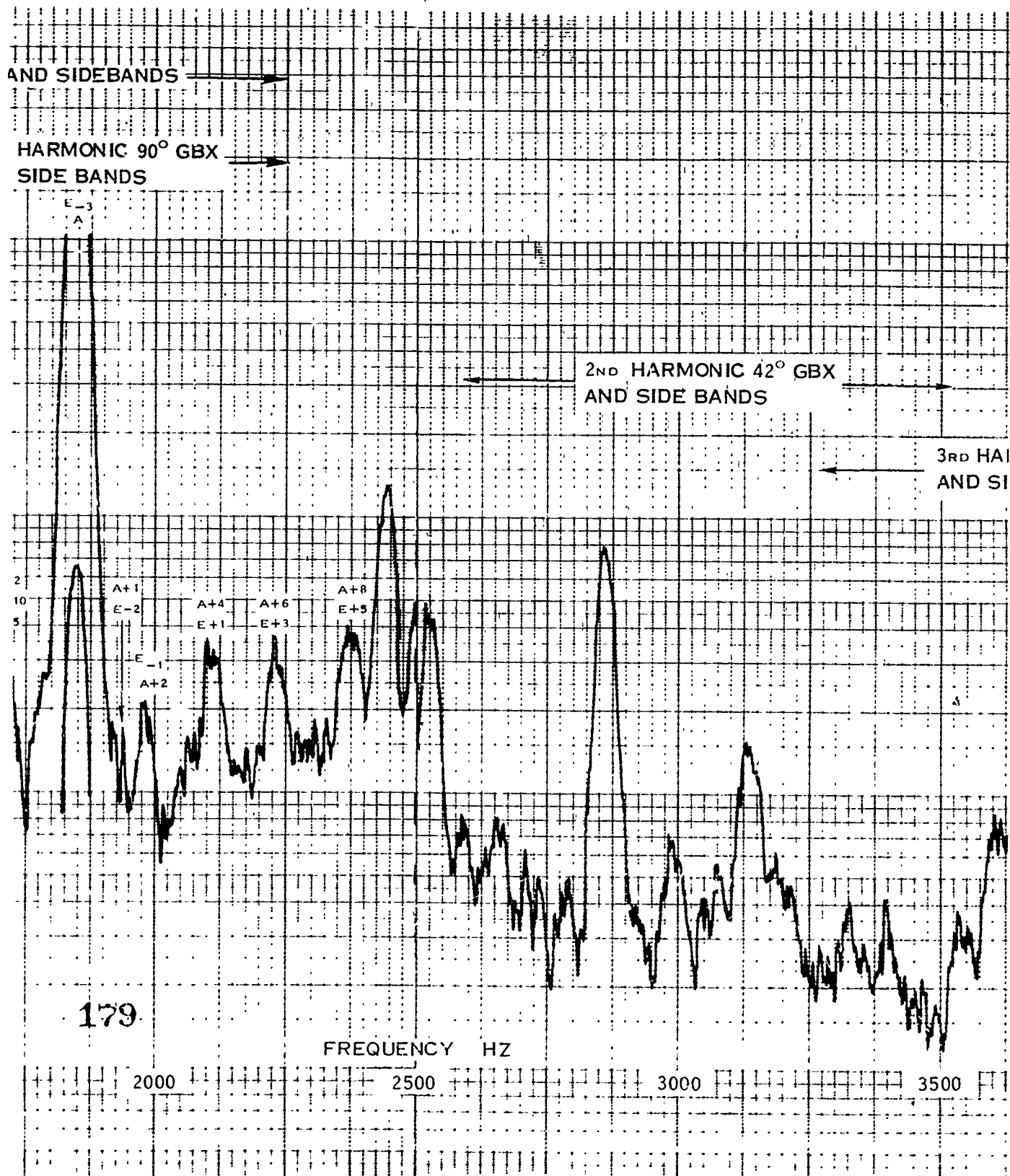
EFFECTIVE ATTENUATION OF THE 2 HZ FILTER IS APPROXIMATELY -60 DB AT 960 HZ

FIGURE 6-47



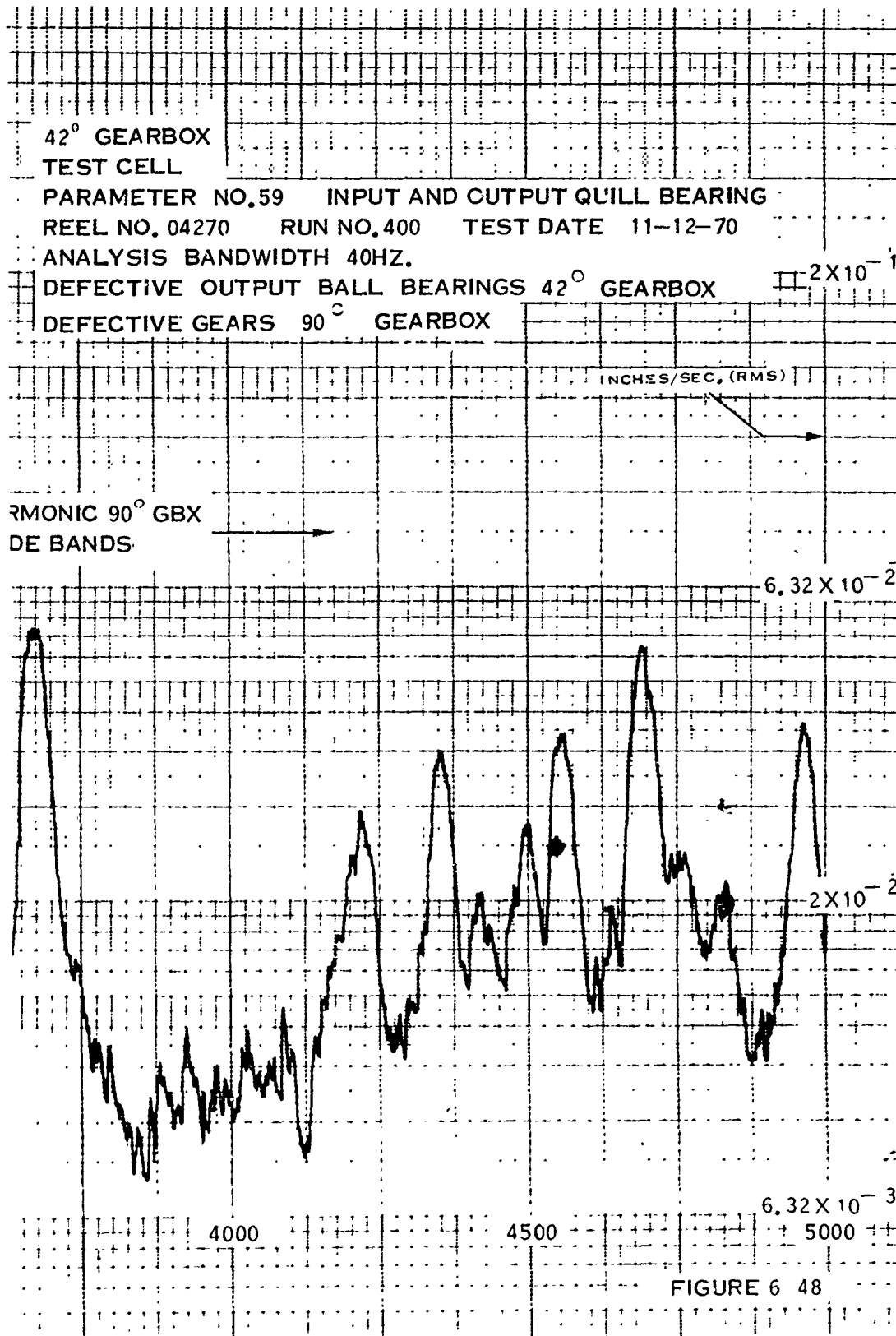
6-48A



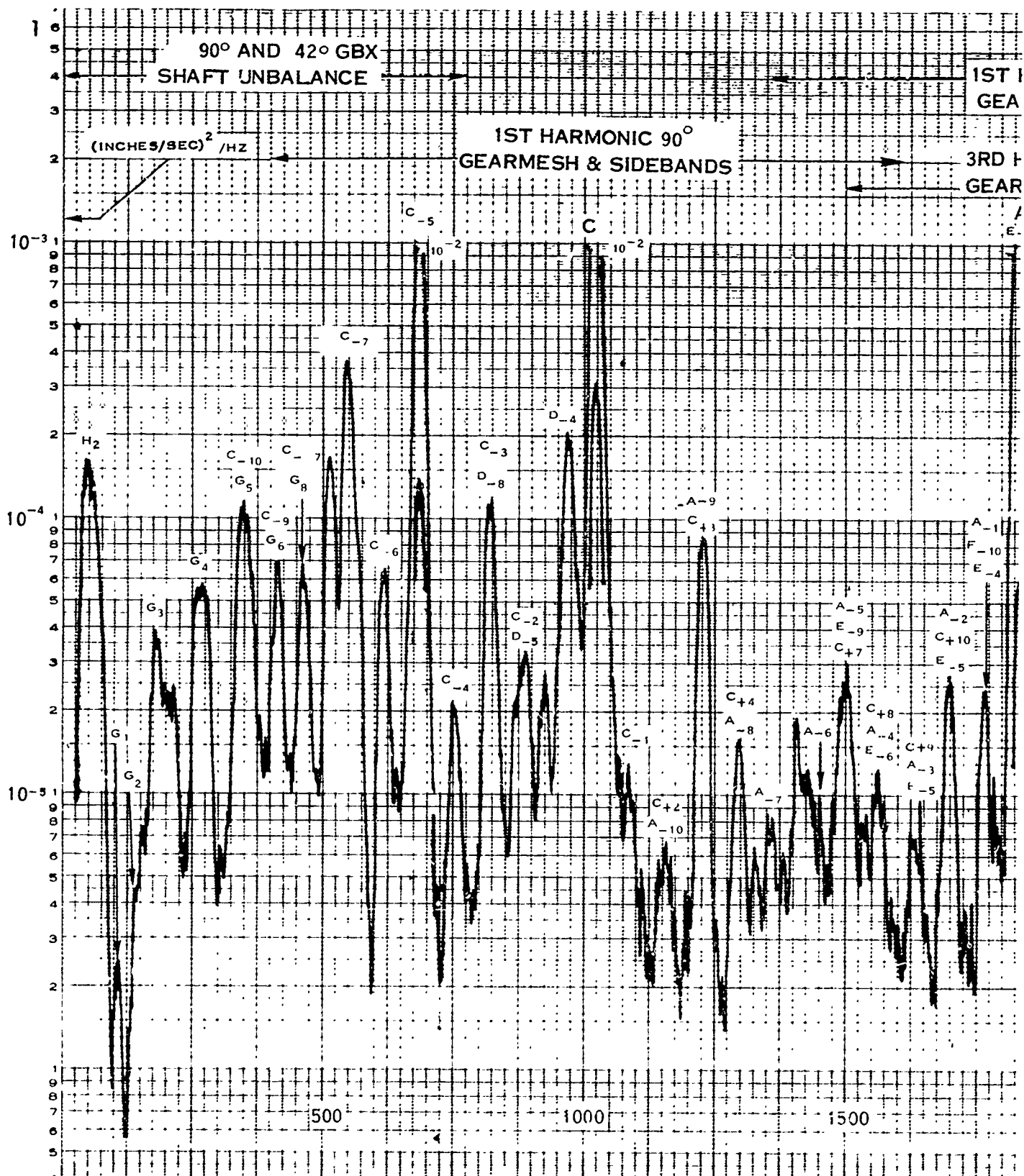


6-48 B

77-54 6080  
11-12-70



6-48 C



HARMONIC 42°  
RMESH & SIDEBANDS

HARMONIC 90°  
MESH AND SIDEBANDS

42°

REE

3RD HARMONIC 90° GEARMESH  
AND SIDEBANDS

2ND HA  
AND S

E<sub>-1</sub>

A<sub>+2</sub>

F<sub>-5</sub>

E<sub>-2</sub>

A<sub>+1</sub>

FREQUENCY - HZ

2000

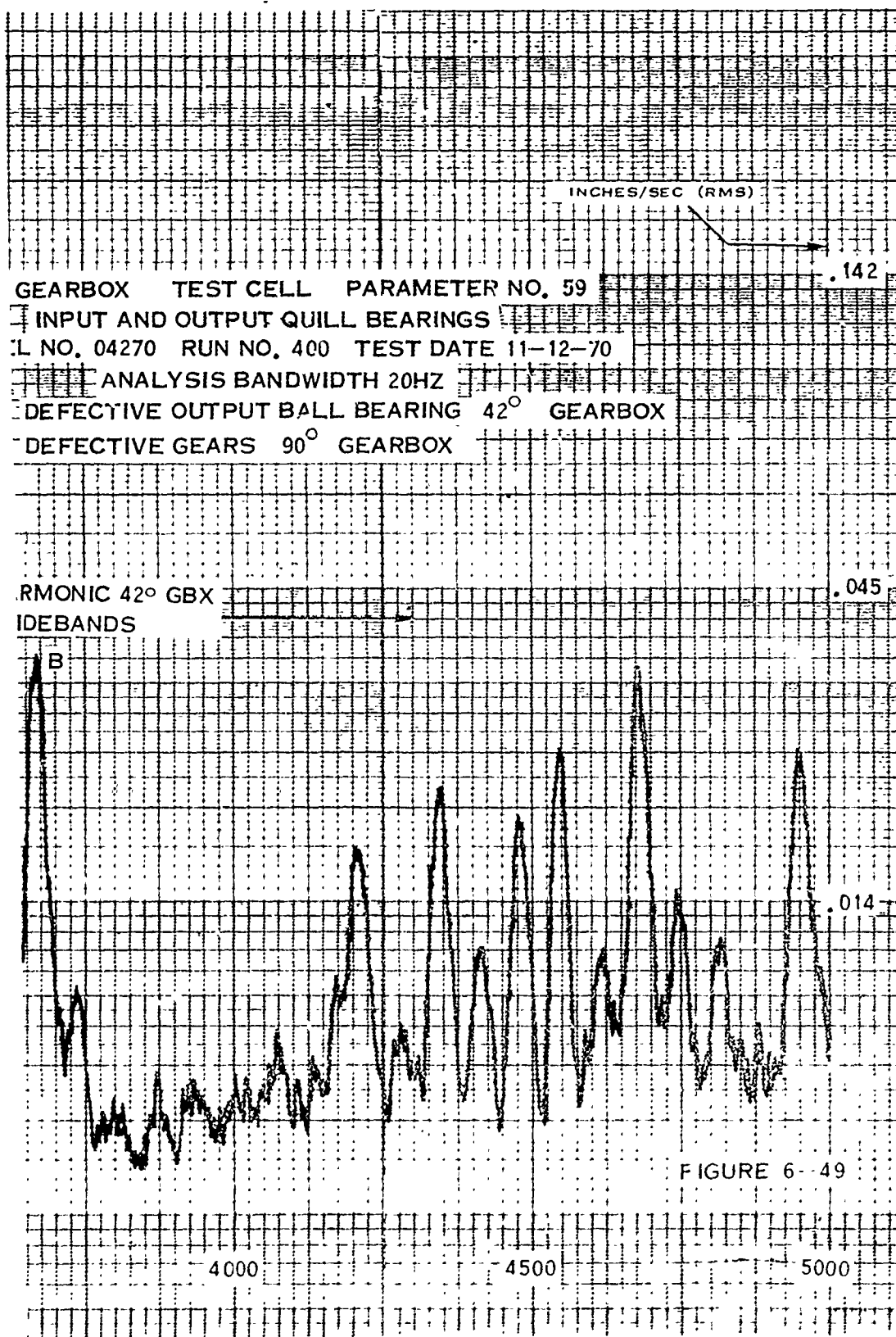
2500

3000

3500

182

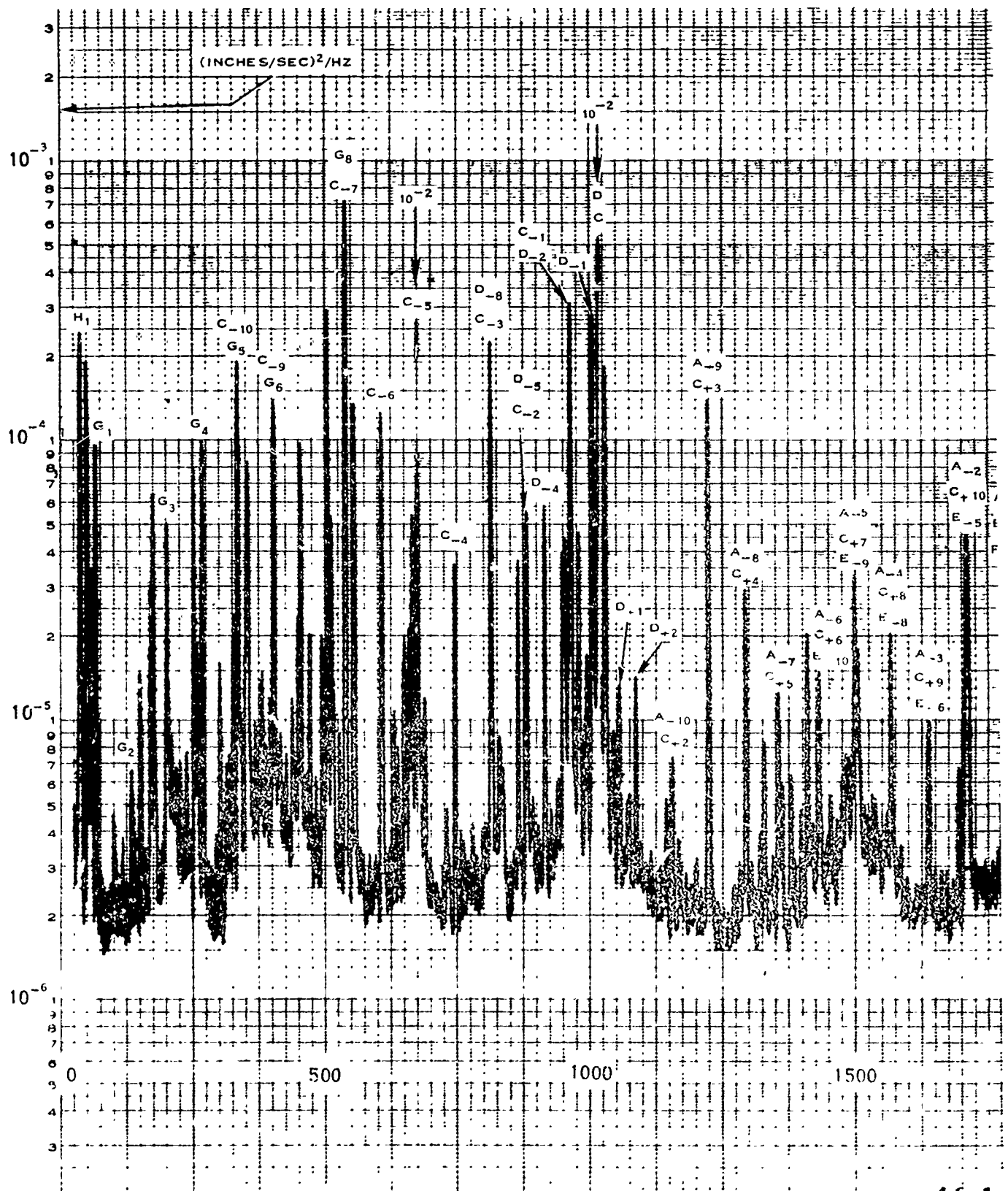
6-49 B



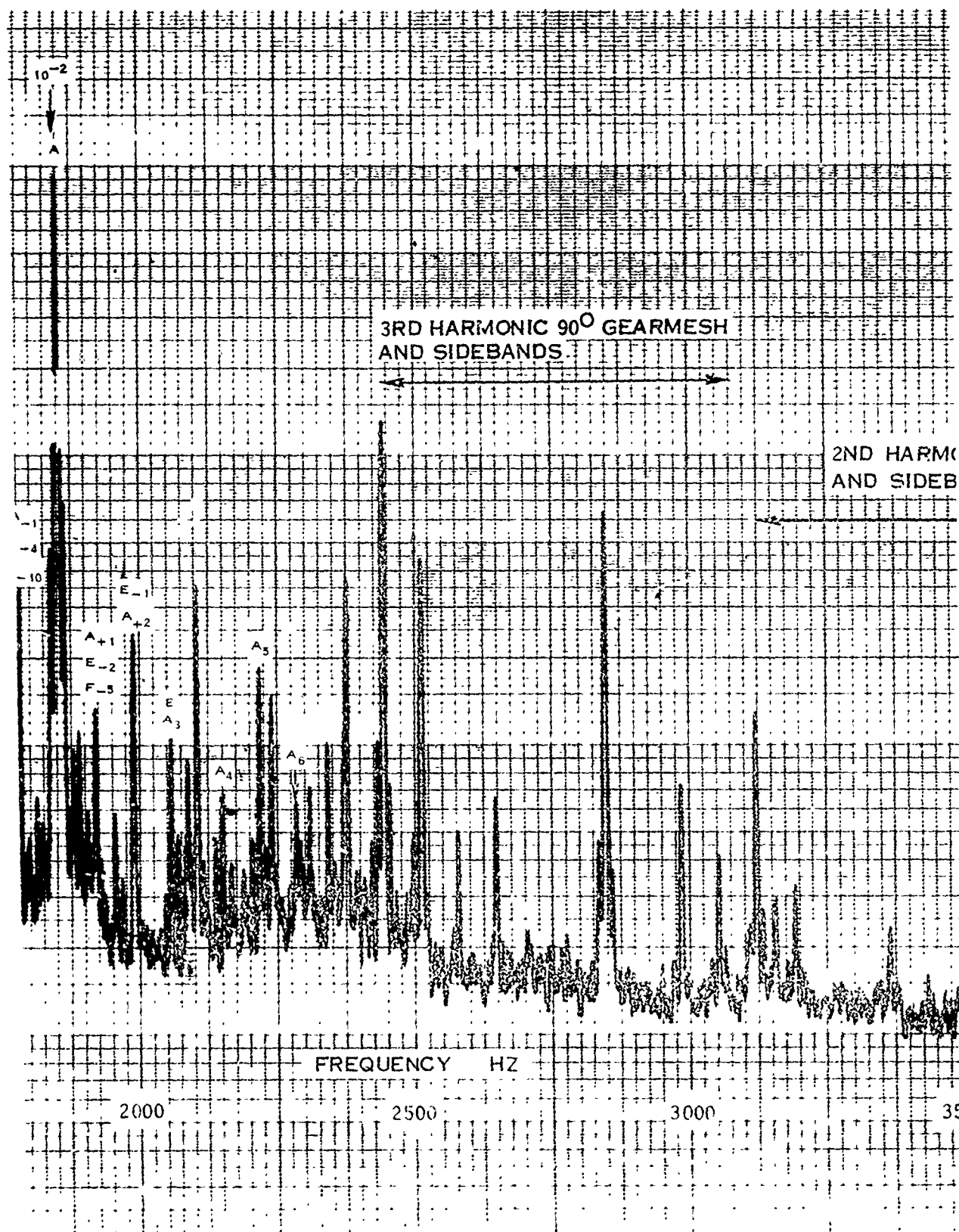
ST F  
SEAF  
RD H  
EAR!

A-1  
-10  
E-4

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100

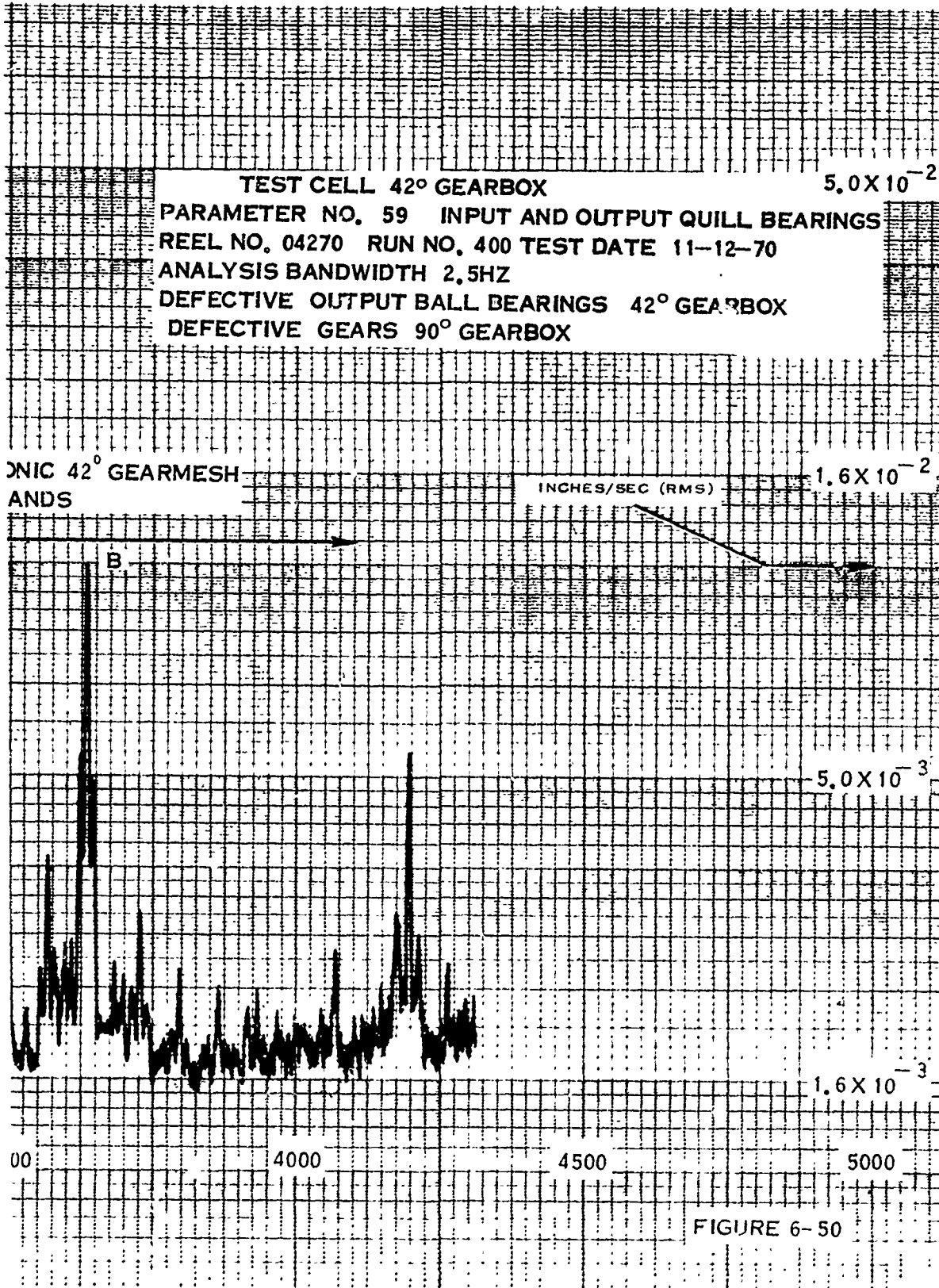


6-518



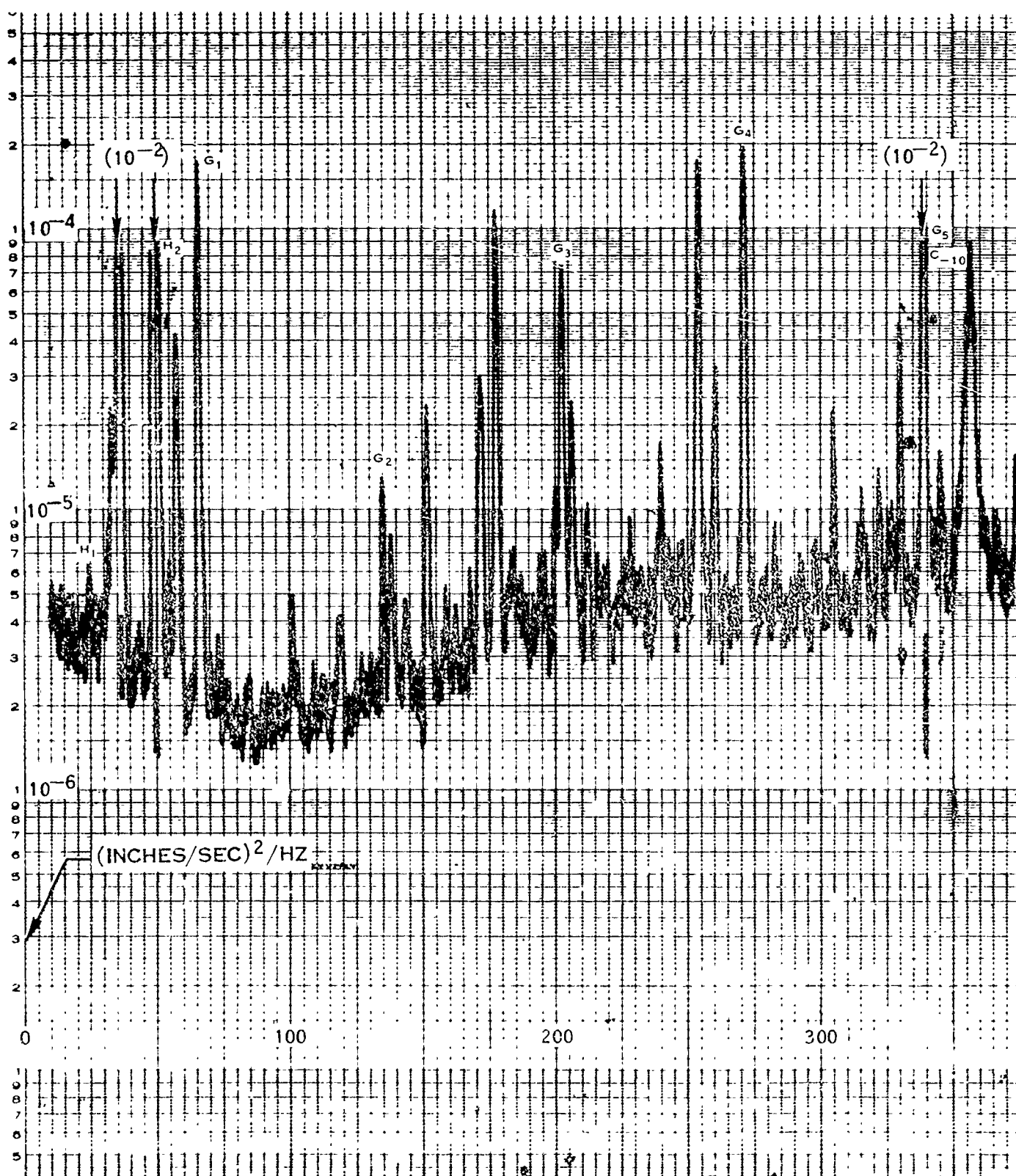


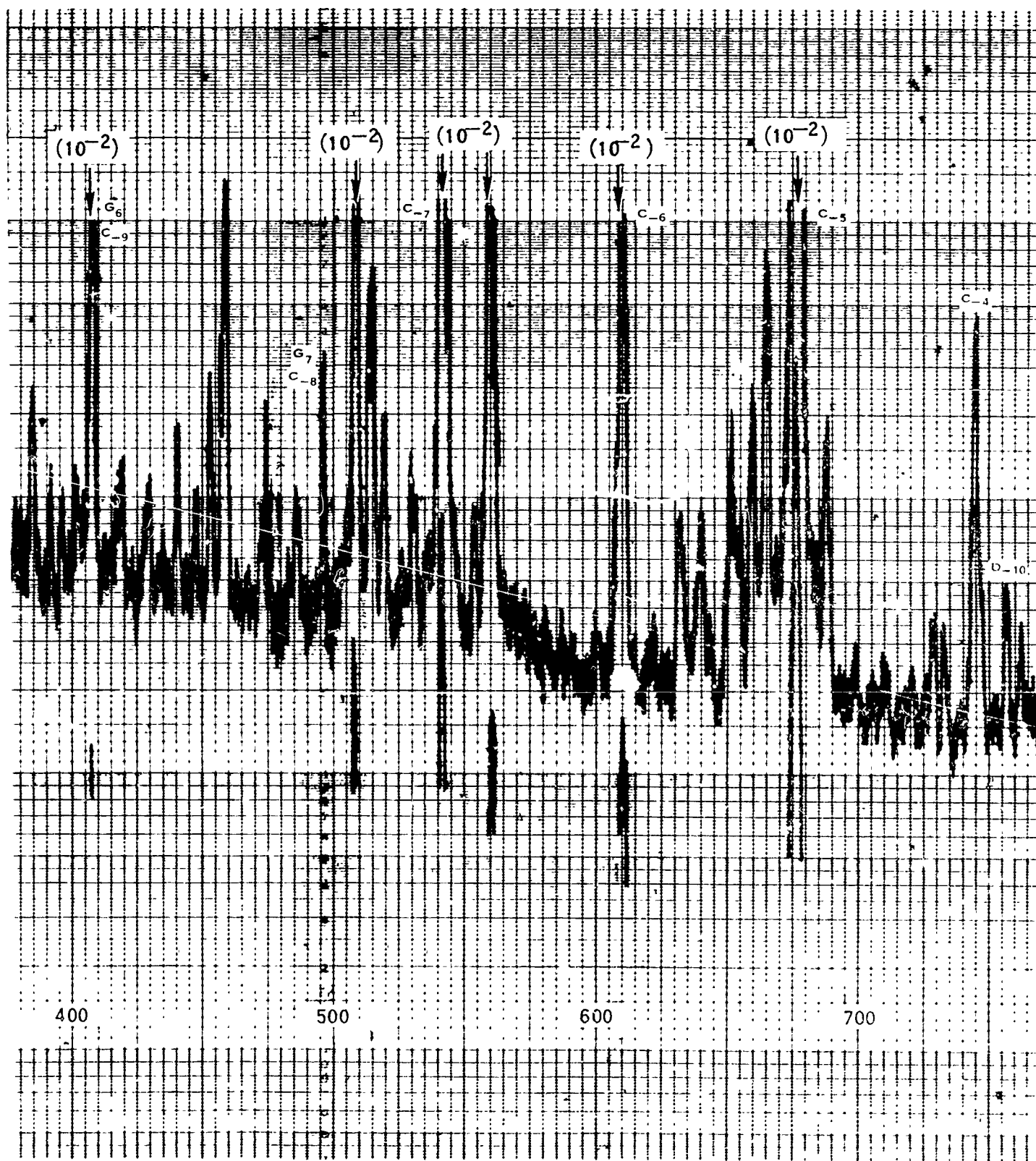
**HSEB 6090  
VOLUME II**

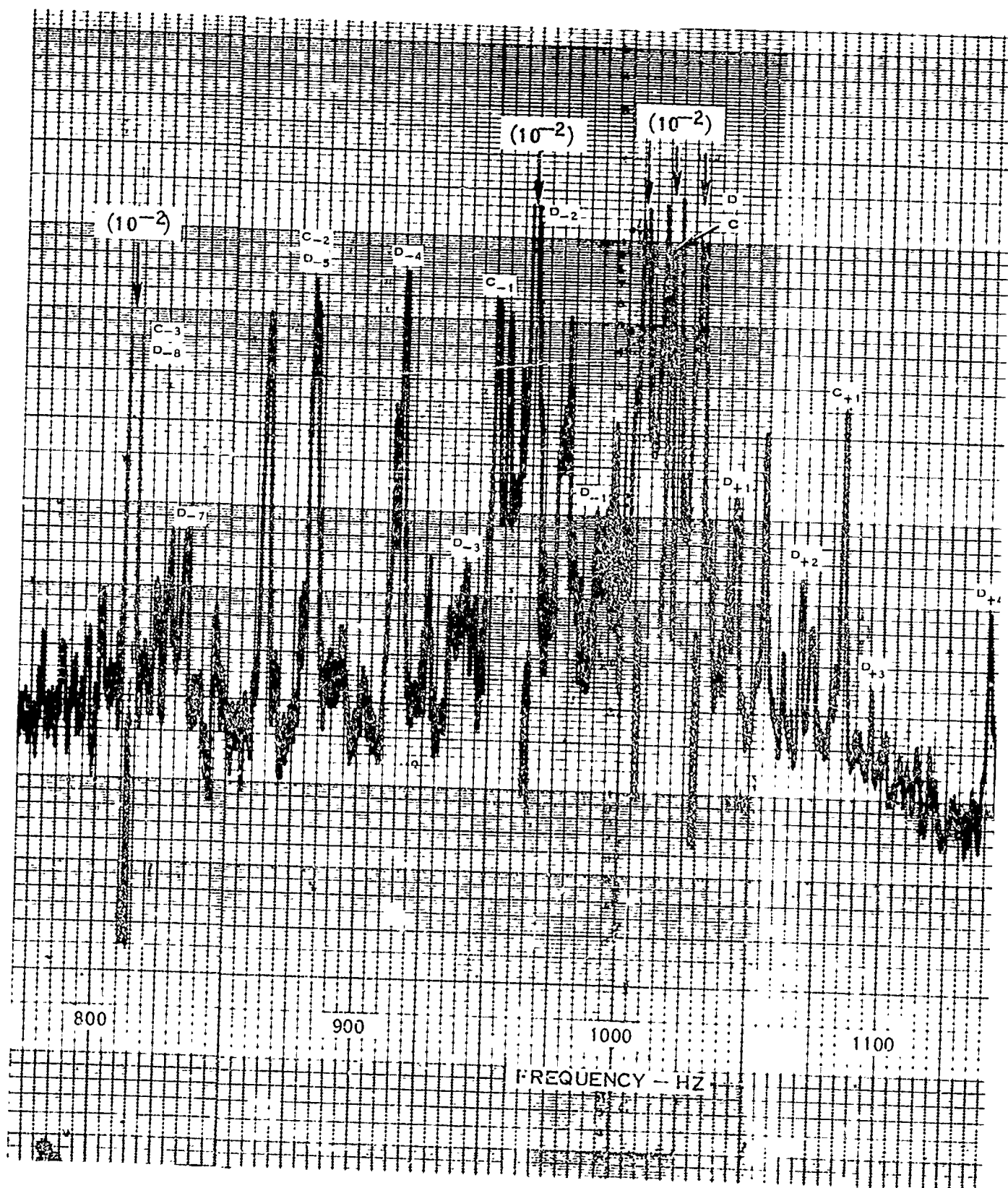


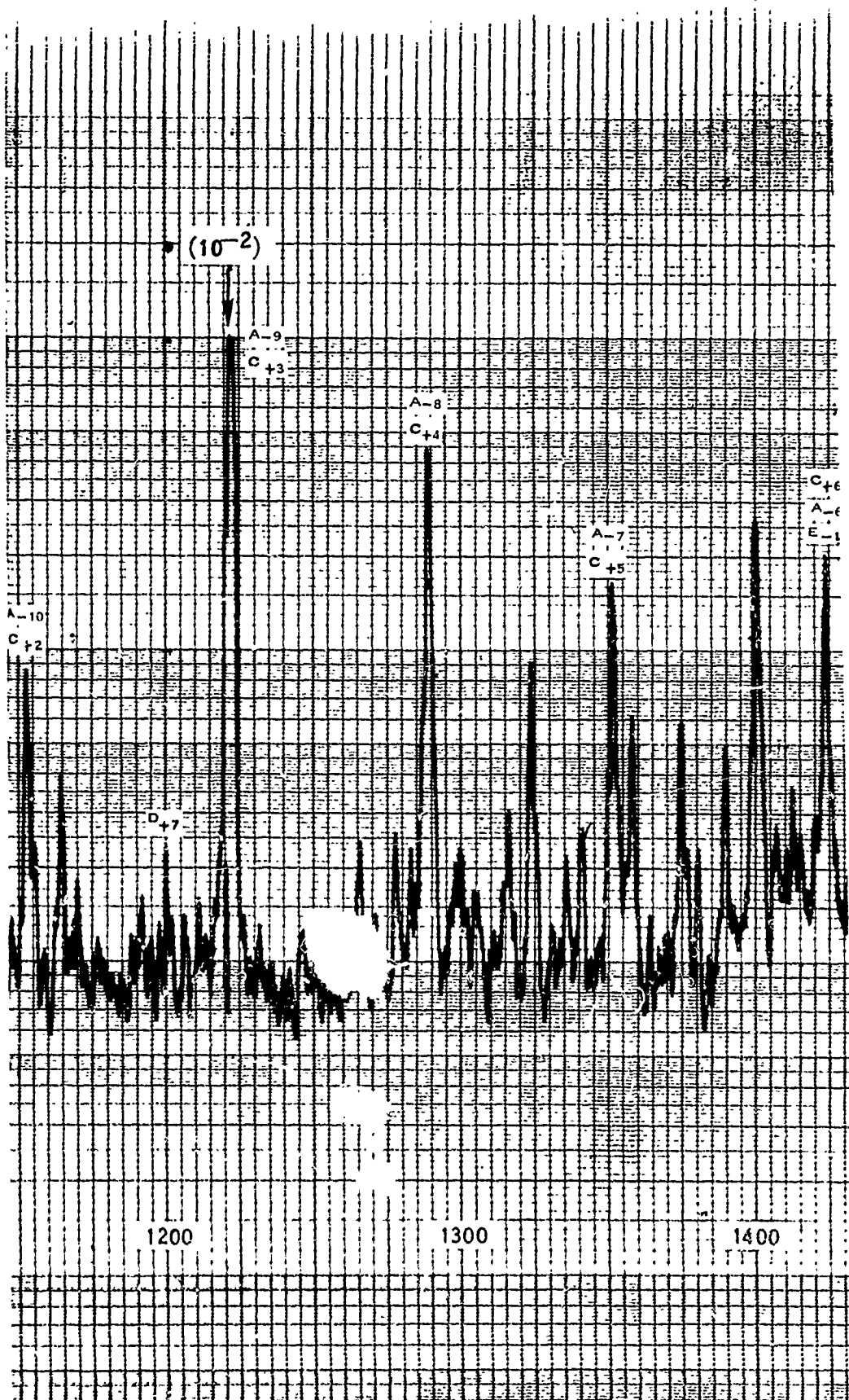
6-50 C

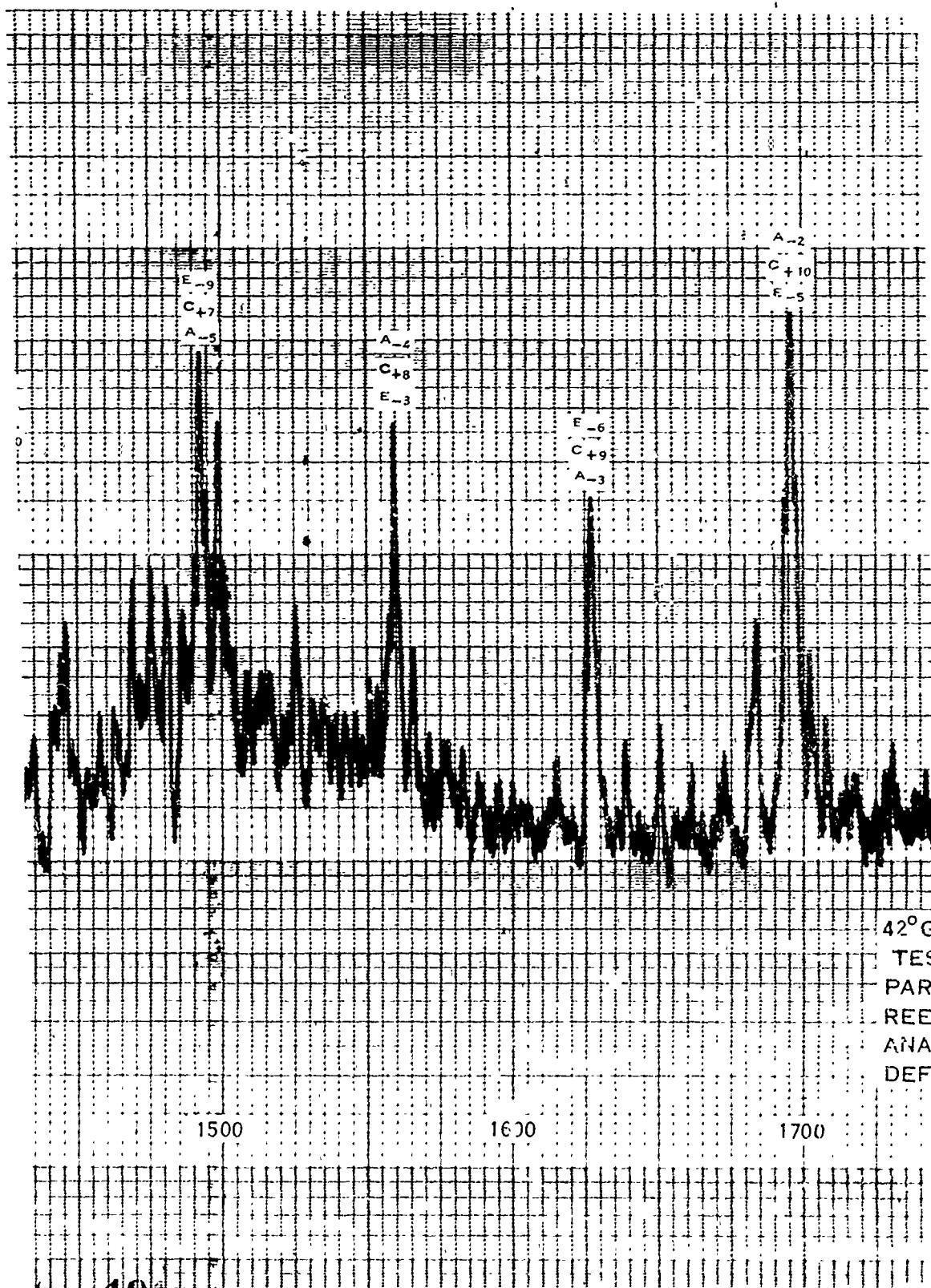








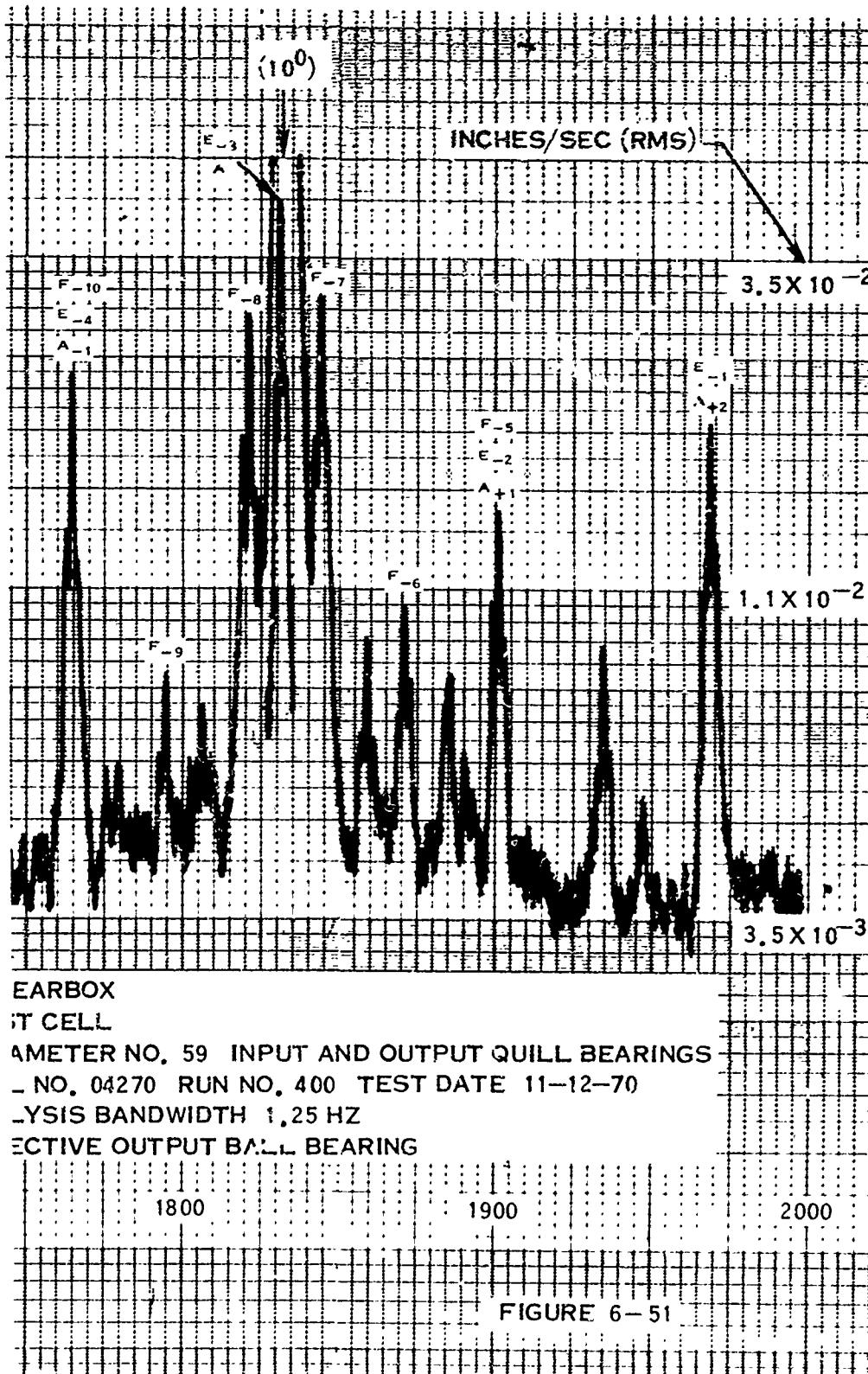




131

6.51 E

HSE 6080  
VOLUME II



EARBOX

IT CELL

AMETER NO. 59 INPUT AND OUTPUT QUILL BEARINGS

\_ NO. 04270 RUN NO. 400 TEST DATE 11-12-70

YSIS BANDWIDTH 1.25 HZ

EFFECTIVE OUTPUT BALL BEARING

6-51 F



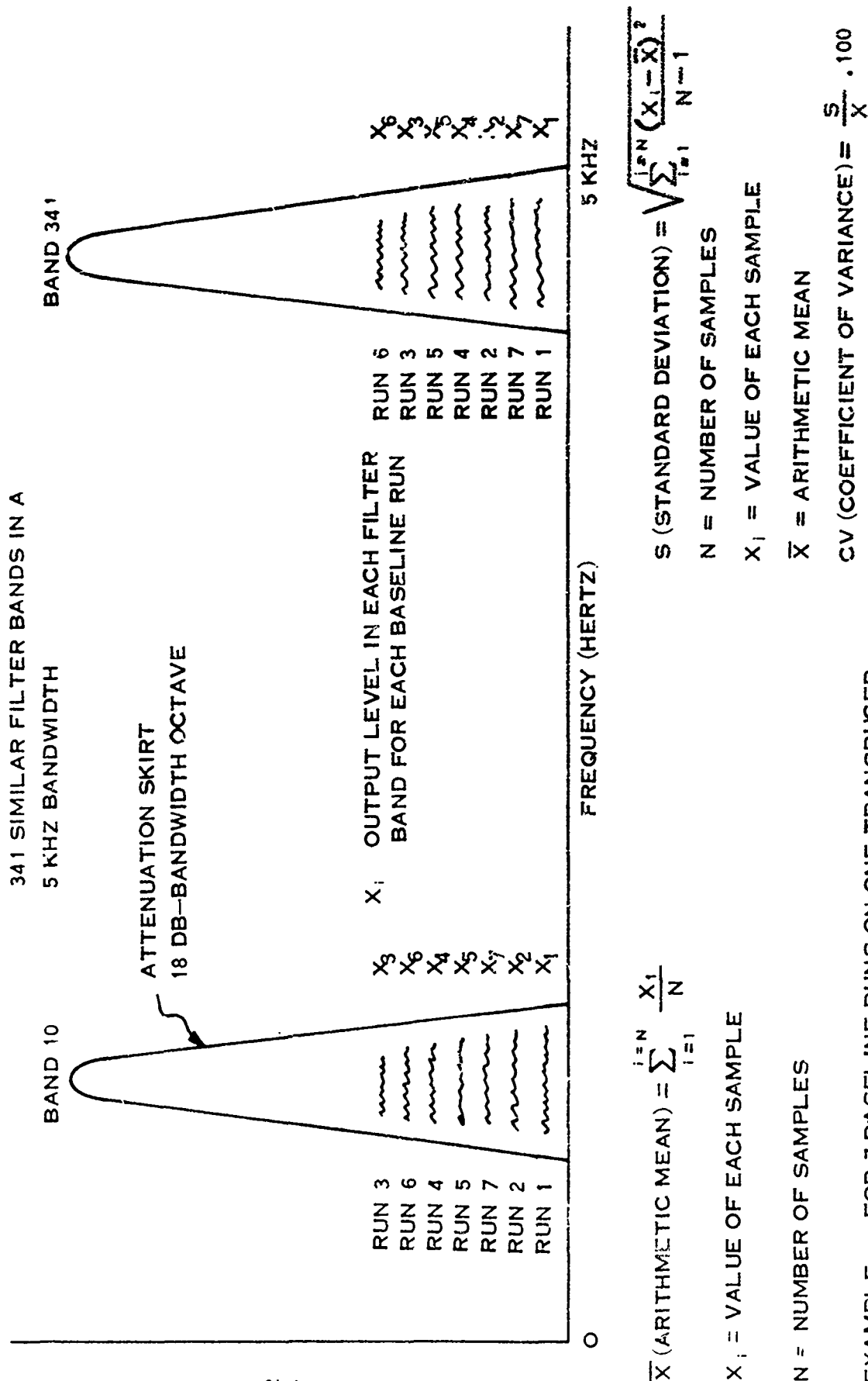
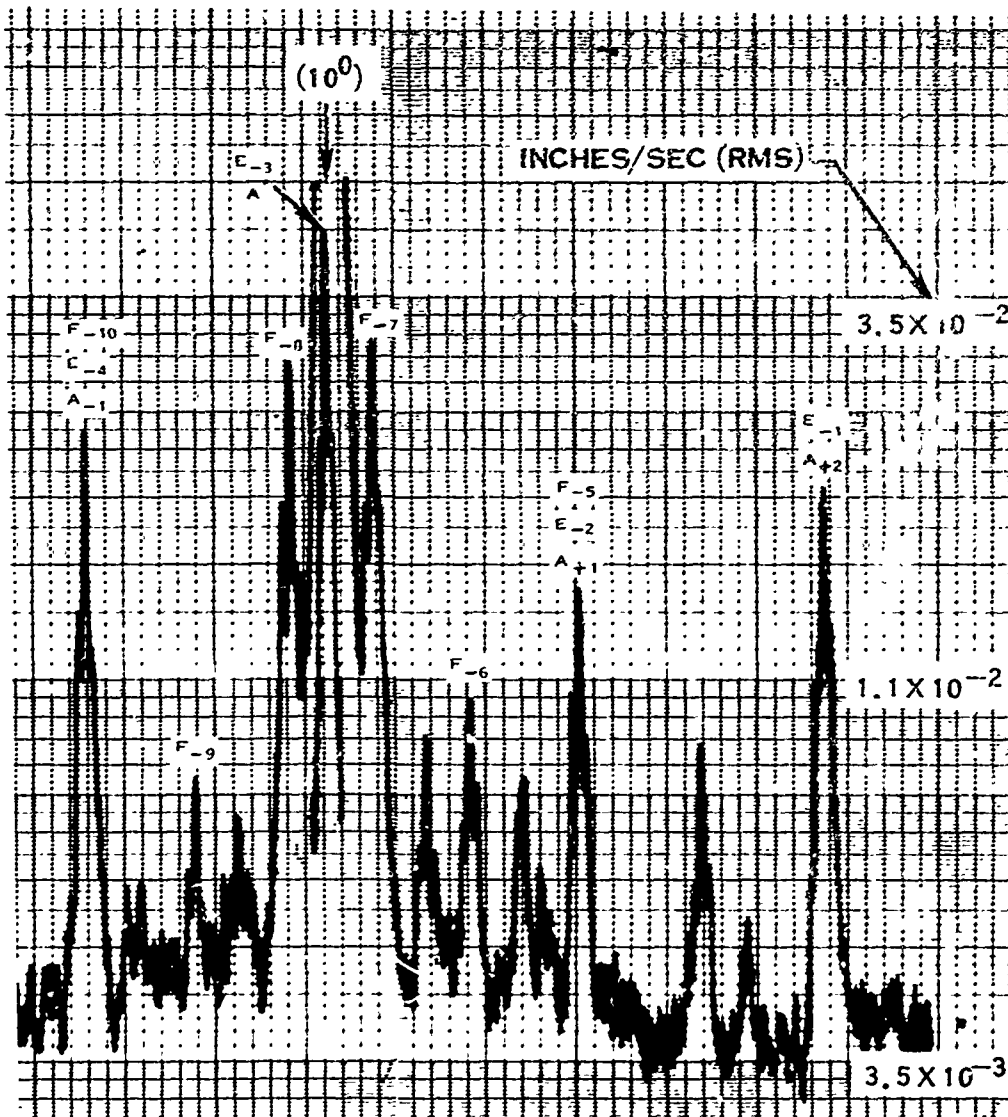


FIGURE 6-52 MEAN AND STANDARD DEVIATION GENERATION

HSE 6080  
VOLUME II



EARBOX  
IT CELL  
AMETER NO. 59 INPUT AND OUTPUT QUILL BEARINGS  
\_ NO. 04270 RUN NO. 400 TEST DATE 11-12-70  
LYSIS BANDWIDTH 1.25 HZ  
EFFECTIVE OUTPUT BALL BEARING

1800

1900

2000

FIGURE 6-51

6-51 F



MSD/AIDAPS COMPARISON SUMMARY ANALYSIS

MEAN IDENTIFICATION# M10201

THE FOLLOWING SPECTRA ARE COMPARED AGAINST THE MEAN SPECTRUM

TAPL	RUN	CHANNEL	SPECTRUM NO.	ITEM SERIAL NO.	NUMBER OF FREQUENCY POINTS WHERE COMPARISON LEVEL IS EXCEEDED			
					M+S	M+25	M+35	M+45
04100	117	2	178A	LE-21173	5	3	0	0
04100	138	2	179A	LE-18832	3	0	0	0
04100	151	2	1810	LE-14568	154	125	0	0
04100	158	2	181A	LE-18107	4	0	0	0
022100	174	2	185A	LE-15351	227	114	52	0
022100	181	2	186A	LE-18953	174	80	28	0
022100	189	2	187A	LE-18257	22	4	0	0
022100	196	2	187A	LE-20727	79	13	0	0

ITEM# ENGINE  
PARAMETER NO. /

UNITS= IN/SEC RPM  
PARAMETER TITLE# NO. 3 AND NO. 4 BEARINGS, DIFFUSOR

ITEM SPEED= 6600.00 RPM  
FREQUENCY RANGE= 5000 HZ

TRANSMISSION INPUT SPEED= 6600 RPM TORQUE= 10504 INLB

ANALYSIS BW= 21.973 HZ

PNT	FREQ	N	PER CENT	PNT	FREQ	N	PER CENT
.....	.....	.....	.....	.....	.....	.....	.....

ALL ENGINES ARE BASELINE

FIGURE 6-53 "GOOD" COMPARISON SUMMARY

HSD/AIDAPS

120-15534 1M18

26864-7

**ENCLOSURE**

100 % = B 27515 (GOOD)



MSD/ADAPS COMPARISON SUMMARY ANALYSIS

MEAN IDENTIFICATION= MN4201

THE FOLLOWING SPECTRA ARE COMPARED AGAINST THE MEAN SPECTRUM

TAPE	RUN	CHANNEL	SPECTRUM NO.	ITEM SERIAL NO.	NUMBER OF FREQUENCY POINTS WHERE COMPARISON LEVEL IS EXCEEDED				NO. OF SPEC. AVOID.	0			
					M+5	M+28	M+35	M+45					
22187	31	2	16	LE20727	79	17	9	6	0	0			
02724	53	2	45	LE20727	80	19	16	14					
02725	81	2	69	LE20727	107	19	10	7					
ITEM= ENGINE					UNITS= IN/SEC. PK								
PARAMETER NO. 7					PARAMETER TITLE= NO. 3 AND NO. 4 BEARINGS, DIFFUSOR								
ITEM SPEED= 6000.00 RPM					TRANSMISSION INPUT SPEED= 6600 RPM								
FREQUENCY RANGE= 5000 HZ					TORQUE= 10500 INLB								
					ANALYSIS BW= 21.973 HZ								
PNT	FREQ	*****			N	PER CENT	PNT	FREQ	*****			N	PER CENT

ALL ENGINES HAVE FAULTY NO. 3 BEARINGS

FIGURE 6-54 "BAD" COMPARISON SUMMARY

# HSD/AIDAPS

100% = 8 ITEMS (BAD NO. 3 BEARINGS)

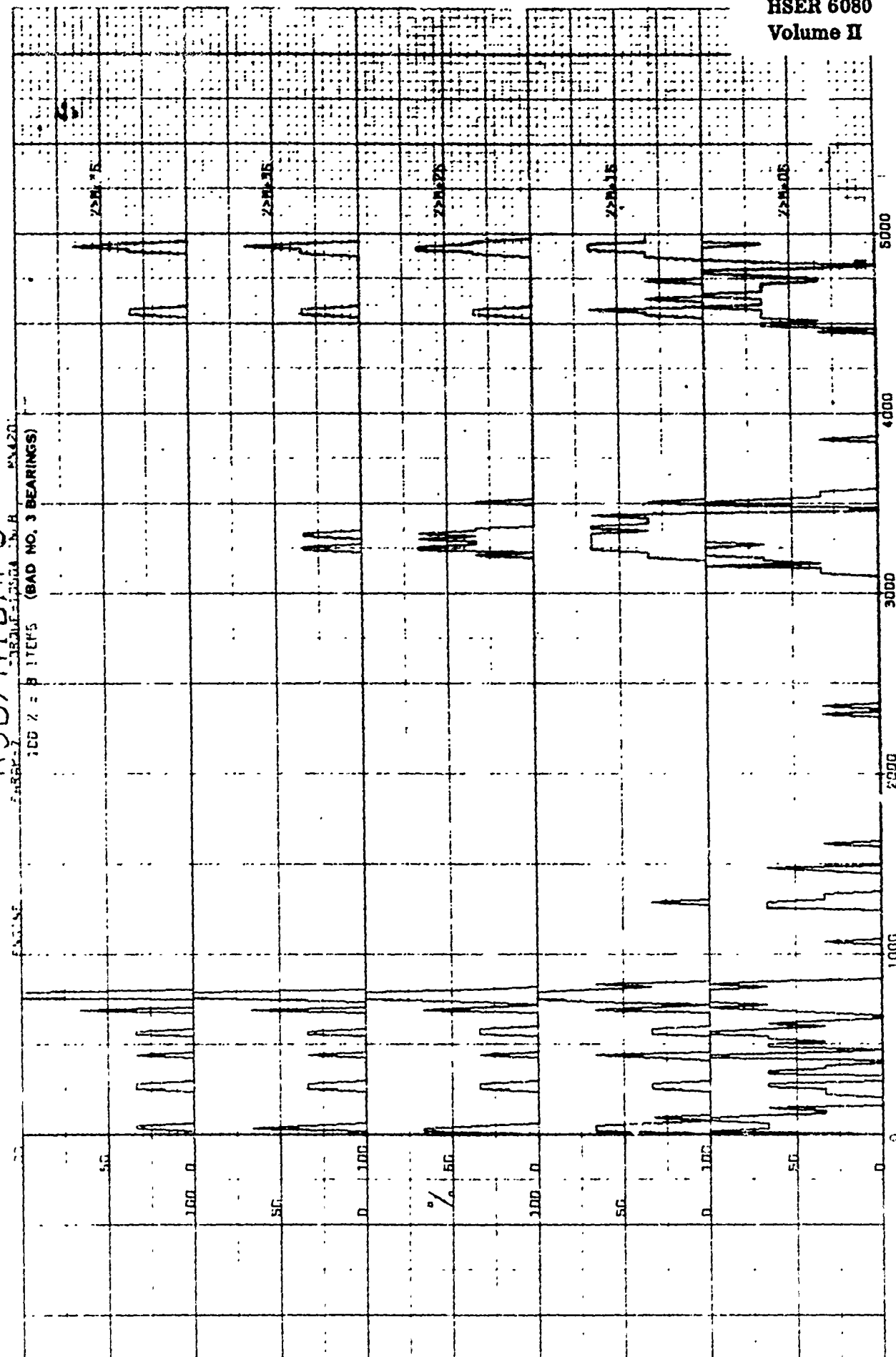


FIGURE 6-54A

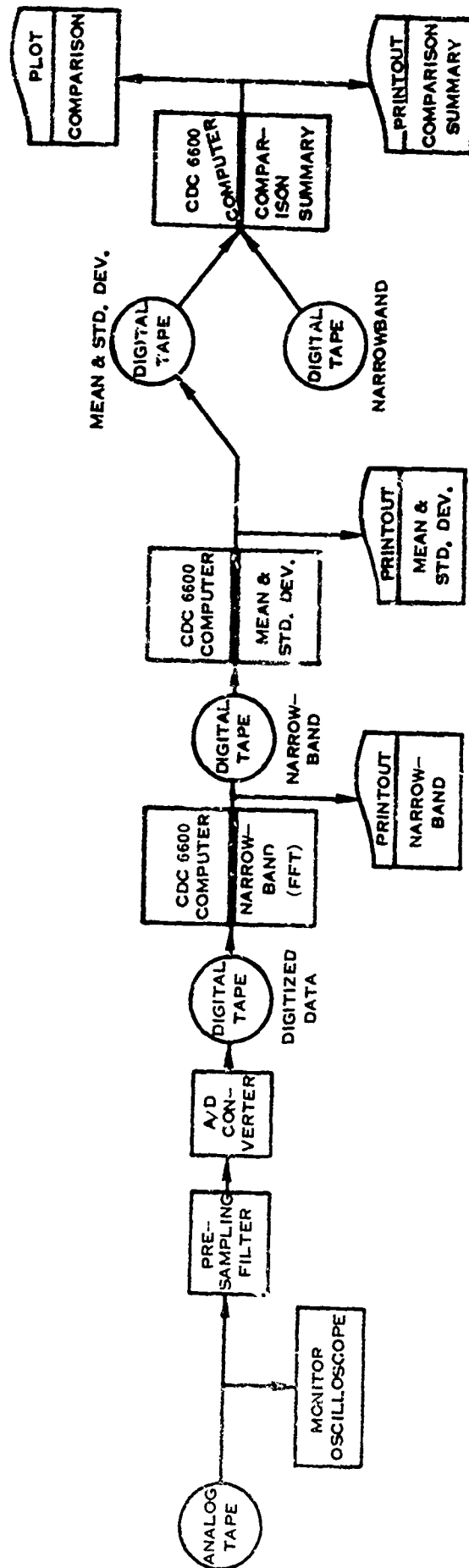


FIGURE 6-55 AIDAPS VIBRATION ANALYSIS... DATA FLOW DIAGRAM

Analysis Range	Anti-Aliasing Filter	Sampling Rate	Data Sample	Number of Frequency Bands	Filter Separation	Effective Bandwidth
5,000 Hz	5,500 Hz	15,000 Hz	2.3 sec.	341	14.64 Hz	21.97 Hz
2,000	2,200	6,000	5.5	341	5.85	8.78
200*	220	600	13.65	85	2.34	3.51

FIGURE 6-56 AIDAPS VIBRATION ANALYSIS PARAMETERS

\*NOTE: Performed on very limited amount of data

HAMILTON STANDARD  
TEST LOG MAGNETIC TAPE RECORDING SYSTEM

DATE 10 30 70

TEST ENGINEER DM W P ACB

TEST TITLE AIDAPS-TRANS & 42° & 90° GRX

TEST VARIABLES										NOTES									
TEST										TEST CONDITIONS									
TEST	TIME	CODE	1	2	3	4	5	6	7	8	9	10	11	12	RPM	Torque			
0 24150-23	Nac		100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	1632	2210			
2 24231-48			0	0	0	0	0	0	0	0	0	0	0	0	1604	3640			
5 24333-06			0	0	0	0	0	0	0	0	0	0	0	0	1604	1170			
7 24434-40			0	0	0	0	0	0	0	0	0	0	0	0	1100	1430			
9 24502-38			0	0	0	0	0	0	0	0	0	0	0	0	1652	2210			
24503-52			0	0	0	0	0	0	0	0	0	0	0	0	1604	3640			
24705-04			0	0	0	0	0	0	0	0	0	0	0	0	1604	1170			
24806-18			0	0	0	0	0	0	0	0	0	0	0	0	1100	1430			
24906-50	STD	10	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	1632	2210			
25008-10	F. S. STD		0	0	0	0	0	0	0	0	0	0	0	0	1604	3640			
25131-50	Use	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	1604	1170			
25233-25			0	0	0	0	0	0	0	0	0	0	0	0	1604	3640			
25336-33			0	0	0	0	0	0	0	0	0	0	0	0	1604	1170			
25439-15			0	0	0	0	0	0	0	0	0	0	0	0	1604	3640			
25553-53			0	0	0	0	0	0	0	0	0	0	0	0	1604	1170			
25655-20			0	0	0	0	0	0	0	0	0	0	0	0	1604	3640			
25758-00			0	0	0	0	0	0	0	0	0	0	0	0	1604	1170			
25800-52			0	0	0	0	0	0	0	0	0	0	0	0	1604	3640			
25952-30			0	0	0	0	0	0	0	0	0	0	0	0	1604	1170			
26054-10			0	0	0	0	0	0	0	0	0	0	0	0	1604	3640			
26157-10			0	0	0	0	0	0	0	0	0	0	0	0	1604	1170			
26259-45			0	0	0	0	0	0	0	0	0	0	0	0	1604	3640			
26303-130	STD	10	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	1632	2210			
26404-05	F. S. STD	10	0	0	0	0	0	0	0	0	0	0	0	0	1604	3640			
26517-55	STD	10	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	1632	2210			
26618-55	F. S. STD	10	0	0	0	0	0	0	0	0	0	0	0	0	1604	3640			
26714-	Use	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	100 X	1604	1170			
26811-10			0	0	0	0	0	0	0	0	0	0	0	0	1604	3640			
26914-10			0	0	0	0	0	0	0	0	0	0	0	0	1604	1170			
27016-47			0	0	0	0	0	0	0	0	0	0	0	0	1604	3640			

HSER 6080  
Volume II

FIGURE 6-57





# HS AIDAP'S VIBRATION LOG SHEET

NOTE TRANSDUCER SERIAL NUMBERS PER RUN IN  
TAPE TEST LOGSHEET

DATE	ITEM TESTED	SERIAL NUMBER	TOTAL TIME ON ITEM (Hrs)	TYPE AND DEGREE OF MALFUNCTION-LOCATION	S/Ns of MALFUNCTION ITEM	TOTAL RUNNING TIME (Hrs)	REL/LOG SHEET #	RUN NUMBER	DESCRIPTION OF TEST ITEM	AVERAGE TEST LOG NUMBER		REMARKS
10-26-70	420	B13-2545	1470	Pitted Inner Race and Grooved Pitted Rollers Inner Roller Race	0	1/2	02324 1607	150-153	Held For Addit. Defective Parts	--	0	-37 12% sweep and value was 700" ± higher than in any other
10-26-70	900	A13-2065	433	Fatigue Pitted Outer Race and Pitted Rollers	4428	1/2	02324 1607	150-153	Held For Addit. Defective Parts	--	0	-13 12% sweep were seen Black loss 1005---007
10-26-70	420	ABB-289	1500	Pitted Inner Race & Rollers	1228c	1/2	02324 1608	154-157	Held For Addit. Defective Parts	--	0	-37 --
10-26-70	900	A13-2772	709	Fatigue Pitted Outer Race	18063	1/2	02324 1608	154-157	Held For Addit. Defective Parts	--	0	-13 --
10-26-70	420	B12-8304	1400	Rusty Pitted Rollers	101799	1/2	02324 1608	158-161	Held For Addit. Defective Parts	--	0	-37 --
10-26-70	900	B12-6624	1092	Fatigue Pitted Outer Race & Rollers	2011	1/2	02324 1608	158-161	Held For Addit. Defective Parts	--	0	-13 --
10-26-70	Engine	LE-14566	1401	N.A.	N.A.	--	022167 2452	17-	Production Engine	--	0	-13 Control boom vib. without load vibration vibration has 3 m/s disp. 100% out-of- phase
10-27-70	Trans- mission	ABU-11153	1093 bearing 1090	Rust Pitted Ball & Outer Race Main Race Bearing	274856E	--	02324 1608	165	Held For Addit. Defective Parts	--	0	-5 Test 8/11 10042 Requi 10312-38
10-27-70	Trans- mission	ABU-11153	1093	Rust Pitted Ball & Outer Race Main Race Bearing	457	--	02324 1608	--	Held For Addit. Defective Parts	--	0	-5 10-2412 10312-37

HSER 6080  
Volume II

FIGURE 6-59

ITEM TRANSMISSION  
PARAMETER NO. 120  
ITEM SOLUTION  
FREQUENCY RANGE 200 HZ  
ITEM TRANSMISSION INPUT SPEED 6600 RPM  
ITEM TRANSITION HZ 3510 HZ  
ITEM TEST LOG SHEET NO. 1093  
ITEM SPECTRUM NO. 1093  
ITEM HUN NO. 33  
ITEM TORQUE 74 PERCENT

PNT	FREQ	IN/SEC:PK	PNT	FREQ	IN/SEC:PK
2	2.3030	0.550E-04	44	100.7613	1.03E-02
3	2.6475	2.45E-02	45	103.1258	1.03E-02
4	2.7013	4.75E-02	46	105.4688	1.03E-02
5	2.7013	5.30E-02	47	107.8125	1.03E-02
6	2.7013	5.60E-02	48	110.1562	1.03E-02
7	2.7013	5.80E-02	49	112.5000	1.03E-02
8	2.7013	6.00E-02	50	114.8438	1.03E-02
9	2.7013	6.20E-02	51	117.1875	1.03E-02
10	2.7013	6.40E-02	52	119.5313	1.03E-02
11	2.7013	6.60E-02	53	121.8750	1.03E-02
12	2.7013	6.80E-02	54	124.2188	1.03E-02
13	2.7013	7.00E-02	55	126.5625	1.03E-02
14	2.7013	7.20E-02	56	128.9063	1.03E-02
15	2.7013	7.40E-02	57	131.2500	1.03E-02
16	2.7013	7.60E-02	58	133.5938	1.03E-02
17	2.7013	7.80E-02	59	135.9375	1.03E-02
18	2.7013	8.00E-02	60	138.2813	1.03E-02
19	2.7013	8.20E-02	61	140.6250	1.03E-02
20	2.7013	8.40E-02	62	142.9688	1.03E-02
21	2.7013	8.60E-02	63	145.3125	1.03E-02
22	2.7013	8.80E-02	64	147.6563	1.03E-02
23	2.7013	9.00E-02	65	150.0000	1.03E-02
24	2.7013	9.20E-02	66	152.3438	1.03E-02
25	2.7013	9.40E-02	67	154.6875	1.03E-02
26	2.7013	9.60E-02	68	157.0313	1.03E-02
27	2.7013	9.80E-02	69	159.3750	1.03E-02
28	2.7013	1.00E-02	70	161.7188	1.03E-02
29	2.7013	1.02E-02	71	164.0625	1.03E-02
30	2.7013	1.04E-02	72	166.4063	1.03E-02
31	2.7013	1.06E-02	73	168.7500	1.03E-02
32	2.7013	1.08E-02	74	171.0938	1.03E-02
33	2.7013	1.10E-02	75	173.4375	1.03E-02
34	2.7013	1.12E-02	76	175.7813	1.03E-02
35	2.7013	1.14E-02	77	178.1250	1.03E-02
36	2.7013	1.16E-02	78	180.4688	1.03E-02
37	2.7013	1.18E-02	79	182.8125	1.03E-02
38	2.7013	1.20E-02	80	185.1563	1.03E-02
39	2.7013	1.22E-02	81	187.5000	1.03E-02
40	2.7013	1.24E-02	82	189.8438	1.03E-02
41	2.7013	1.26E-02	83	192.1875	1.03E-02
42	2.7013	1.28E-02	84	194.5313	1.03E-02
43	2.7013	1.30E-02	85	196.8750	1.03E-02

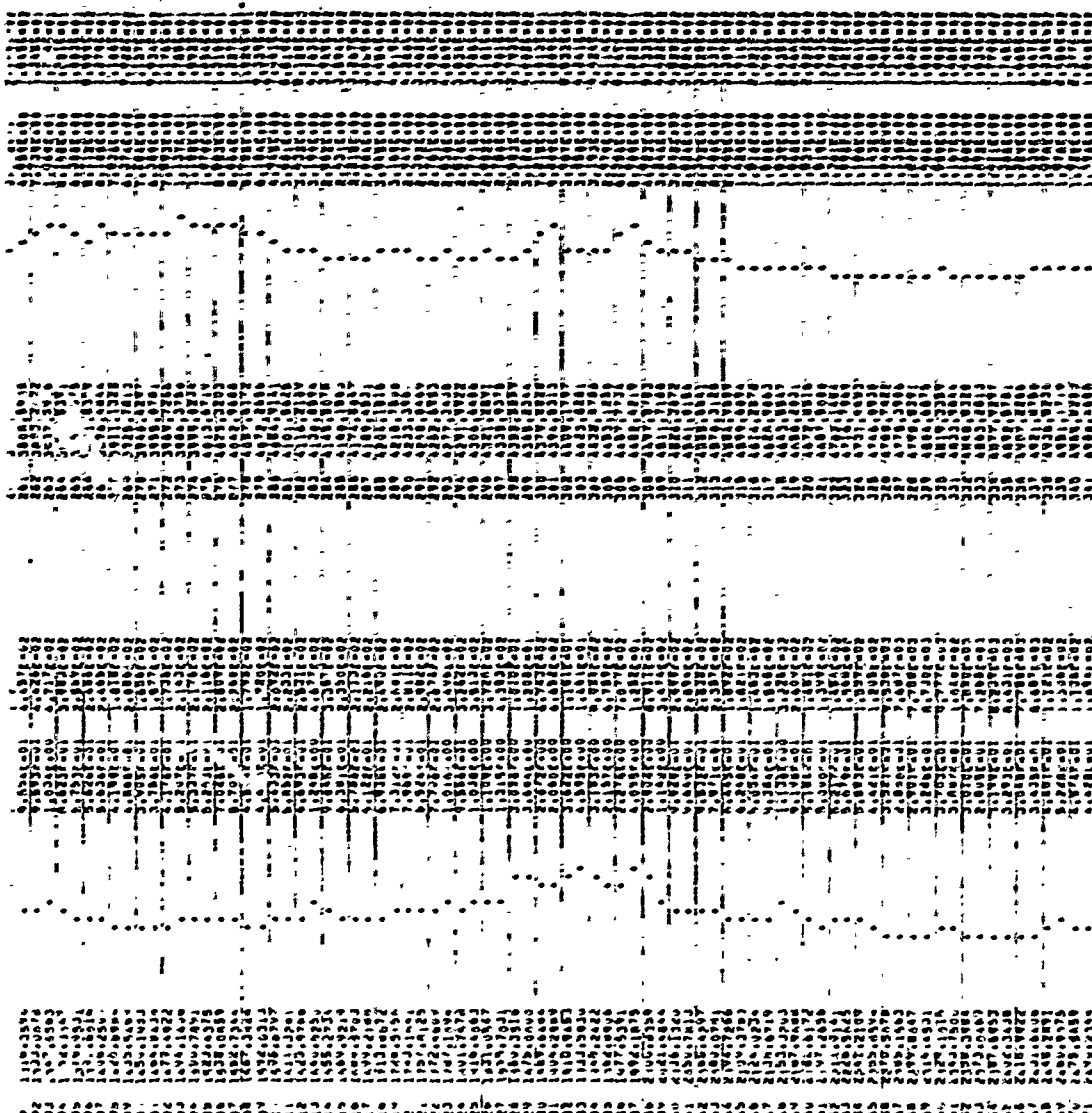
CHARACTERISTIC FREQUENCIES

FR	0.0PK	F5	0.0PK	FP	0.0PK	FR	0.0PK	F1	0.0PK	FO	0.0PK
5.50	3.04E-03	22.00	5.83E-03	2.20	8.55E-04	49.10	1.35E-02	90.50	8.03E-02	47.30	1.47E-02
2FR	0.0PK	3FR	0.0PK								
11.00	1.00E-02		16.50	2.50E-02							

FIGURE 6-60 GROUND TEST BASELINE DATA 200 HZ LOW FREQUENCY ANALYSIS

[illegible]

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CHARACTERISTIC FREQUENCIES

NO	UNIT	FA	QPM	FA	QPM	FA	QPM	FA	QPM
1	1000	1000	1000	1000	1000	1000	1000	1000	1000
2	1000	1000	1000	1000	1000	1000	1000	1000	1000
3	1000	1000	1000	1000	1000	1000	1000	1000	1000
4	1000	1000	1000	1000	1000	1000	1000	1000	1000
5	1000	1000	1000	1000	1000	1000	1000	1000	1000
6	1000	1000	1000	1000	1000	1000	1000	1000	1000
7	1000	1000	1000	1000	1000	1000	1000	1000	1000
8	1000	1000	1000	1000	1000	1000	1000	1000	1000
9	1000	1000	1000	1000	1000	1000	1000	1000	1000
10	1000	1000	1000	1000	1000	1000	1000	1000	1000

E DATA 5000 HZ, HIGH FREQUENCY ANALYSIS

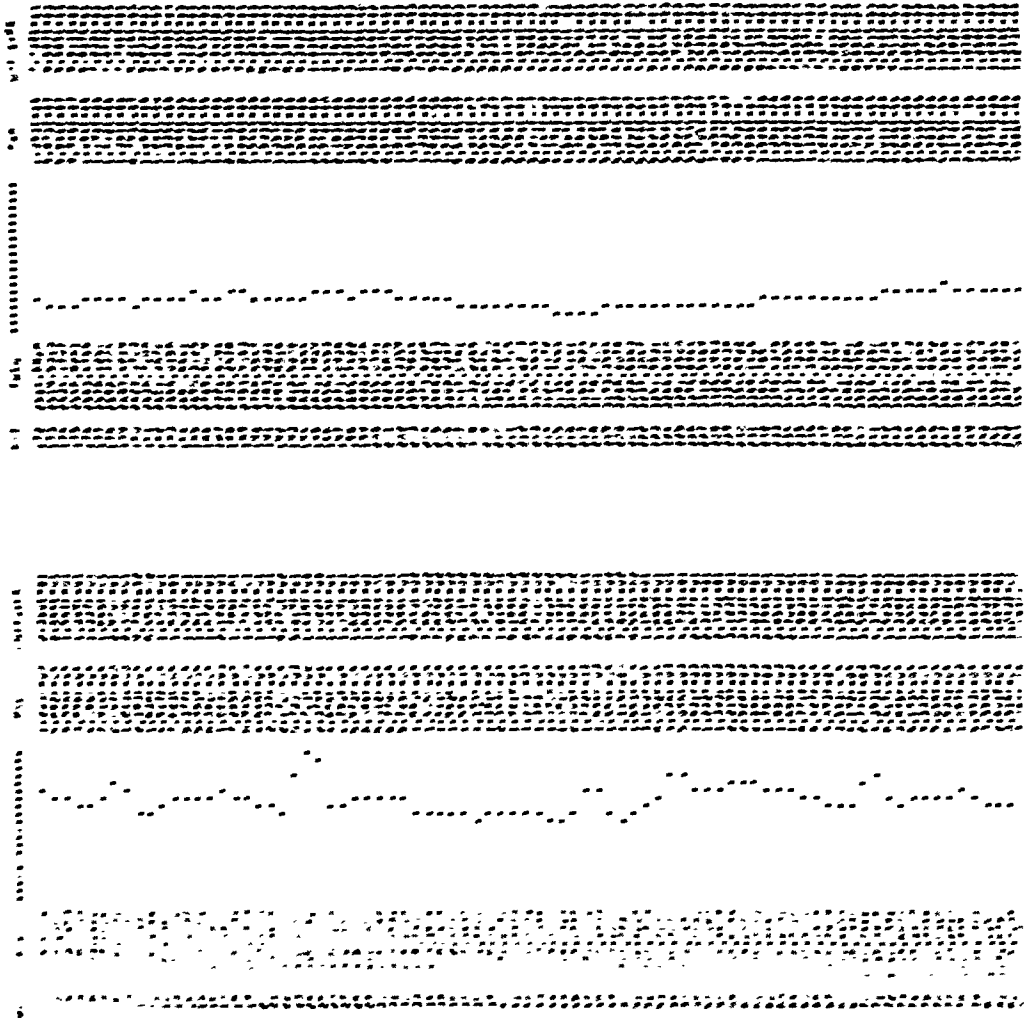
Reproduction of this data is restricted

1. Name of the person or organization to whom this data is being furnished  
 2. Date of the test  
 3. Name of the test facility  
 4. Name of the test equipment  
 5. Name of the test operator  
 6. Name of the test subject  
 7. Name of the test supervisor  
 8. Name of the test engineer  
 9. Name of the test technician  
 10. Name of the test assistant

Reproduction of this data is restricted

1. Name of the person or organization to whom this data is being furnished  
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 4. Name of the test equipment  
 5. Name of the test operator  
 6. Name of the test subject  
 7. Name of the test supervisor  
 8. Name of the test engineer  
 9. Name of the test technician  
 10. Name of the test assistant

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FIGURE 6-62A GROUND TEST M

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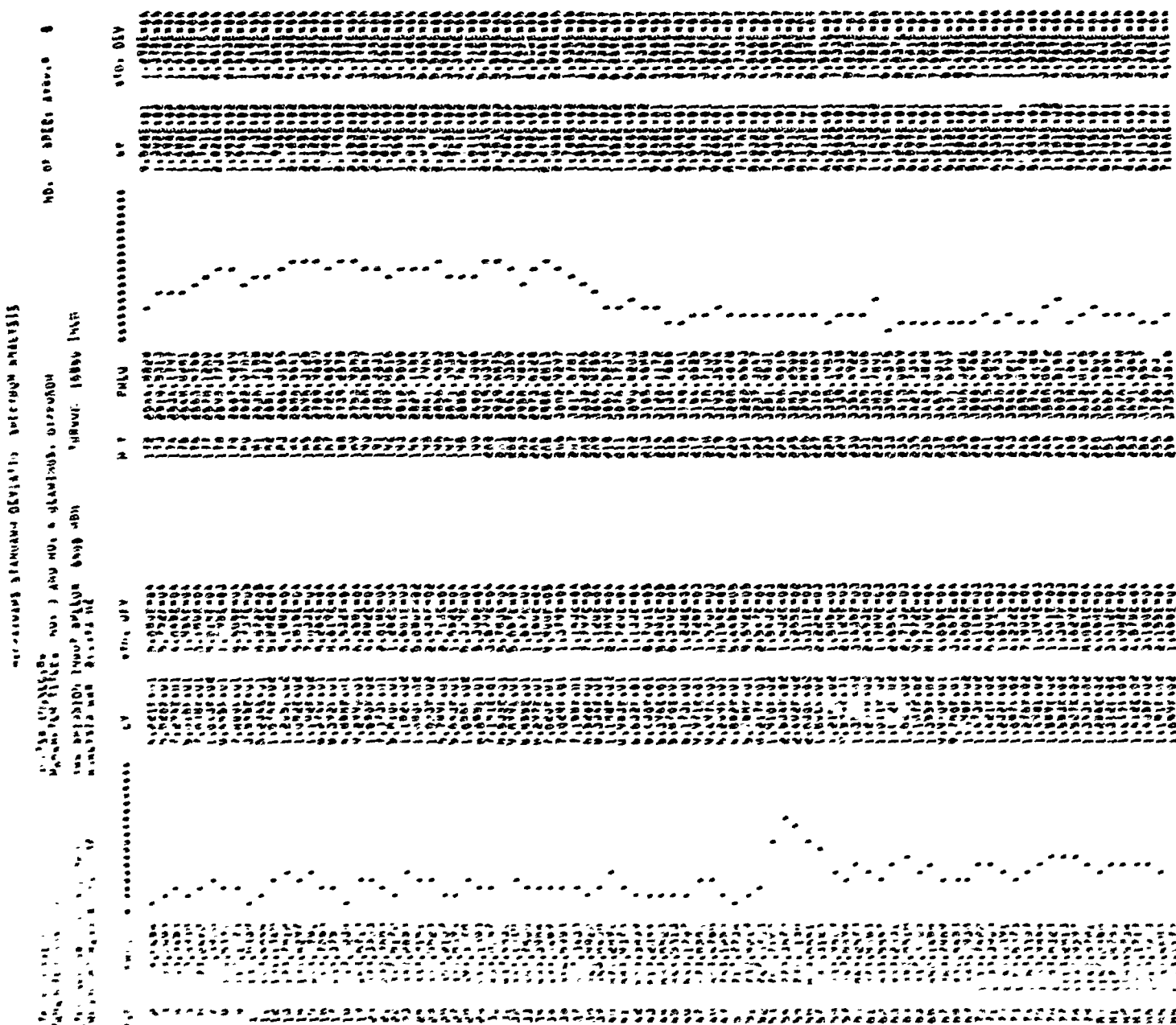
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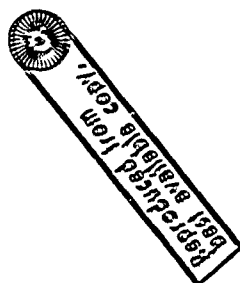
TEST MEAN DEVIATION

6-62 B



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FIGURE 6-63A GROUND TI



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IRKUTSK COMRADES UNION ANALYSIS

MEAN IDENTIFICATION NUMBER

CONFIDENTIAL - SECURITY MATTER

INFECTIOUS DISEASES AND COMPARISON AGAINST THE MEAN SPECTRUM

[illegible]

02216,	1069	013-0304	107	67	49	39
MAJNS CHEATEM	MAJNS	MAJNS	MAJNS	MAJNS	MAJNS	MAJNS
02216,	1205	013-0304	69	33	23	17
MAJNS CHEATEM	MAJNS	MAJNS	MAJNS	MAJNS	MAJNS	MAJNS
02216,	1211	013-0304	69	31	23	10
MAJNS CHEATEM	MAJNS	MAJNS	MAJNS	MAJNS	MAJNS	MAJNS
02216,	1217	013-0304	69	40	30	20
MAJNS CHEATEM	MAJNS	MAJNS	MAJNS	MAJNS	MAJNS	MAJNS
02216,	1223	013-0304	69	45	26	12
MAJNS CHEATEM	MAJNS	MAJNS	MAJNS	MAJNS	MAJNS	MAJNS
0427,	1271	013-0304	74	40	27	20
MAJNS CHEATEM	MAJNS	MAJNS	MAJNS	MAJNS	MAJNS	MAJNS
0427	1277	013-0304	102	63	39	26
MAJNS CHEATEM	MAJNS	MAJNS	MAJNS	MAJNS	MAJNS	MAJNS

ITEM #	QTY	GEAR OIL	PARAMETER NO.	54	UNITS IN/SEC, DK	PARAMETER TITLE	INPUT OIL AND OUTPUT OIL BEARINGS	NO. OF SPECS. REQD.	NO. OF SPECS. AVAILABLE
ITEM SPEED	47200 RPM	TRANSMISSION INPUT SPEED	6400 RPM	TORQUE	3640 IN-LB	ANALYSIS	MM	0.700 HZ	NO. OF SPECS. COMPARISON
FREQUENCY RANGE	1000 HZ								7

### FIGURE 6-64 GROUND TEST FOUR STANDARD DEVIATION COMPARISON SUMMARY:

# MSU/AIDAP'S COMPARISON SUMMARY ANALYSIS

MEAN IDENTIFICATION NUMBER -53

THE FOLLOWING SPECIMA ARE COMPARED ANALYSIS THE 1844 SPECIMEN

TAPE	NO.	CHANNEL	SPECIMEN NO.	ITEM SERIAL NO.	NUMBER OF FREQUENCY POINTS WHERE COMPARISON LEVEL IS EXCEEDED	NO. OF SPEC. AVERAGED
U2391	450	34, 374	1304	ANU-11153	27	9
BANDS GREATER THAN 1045						
U2391	450	3	1405	A12-2614	28	6
U2391	450	3	1411	A12-2655A	30	19
BANDS GREATER THAN 1045						
		A, 43, 44, 51, 52, 53, 125,				

ITEMS TRANSMISSION	UNIT IN INCHES	HAST HALL BEARING ANAL	NO. OF SPEC. AVERAGED
PARAMETER NO. 47	PARAMETER 1111		
ITEM SPEED= 6600.00 RPM	TRANSMISSION INPUT SPEED= 6600 RPM	TORQUE= 120 PRCN	NO. OF SPEC. COMPARED
FREQUENCY RANGE= 5000 Hz	ANALYSIS FROM 21073 Hz		

DEFECTIVE SUN GEAR

**TOUGHER THAN BRASS**

761251654581

200

# CONCLUSION

**DEPT**

2014

237118

2047.

**FIGURE 6-60**

**HSEIR 6080**  
**Volume II**

**FREQUENCY, HZ**

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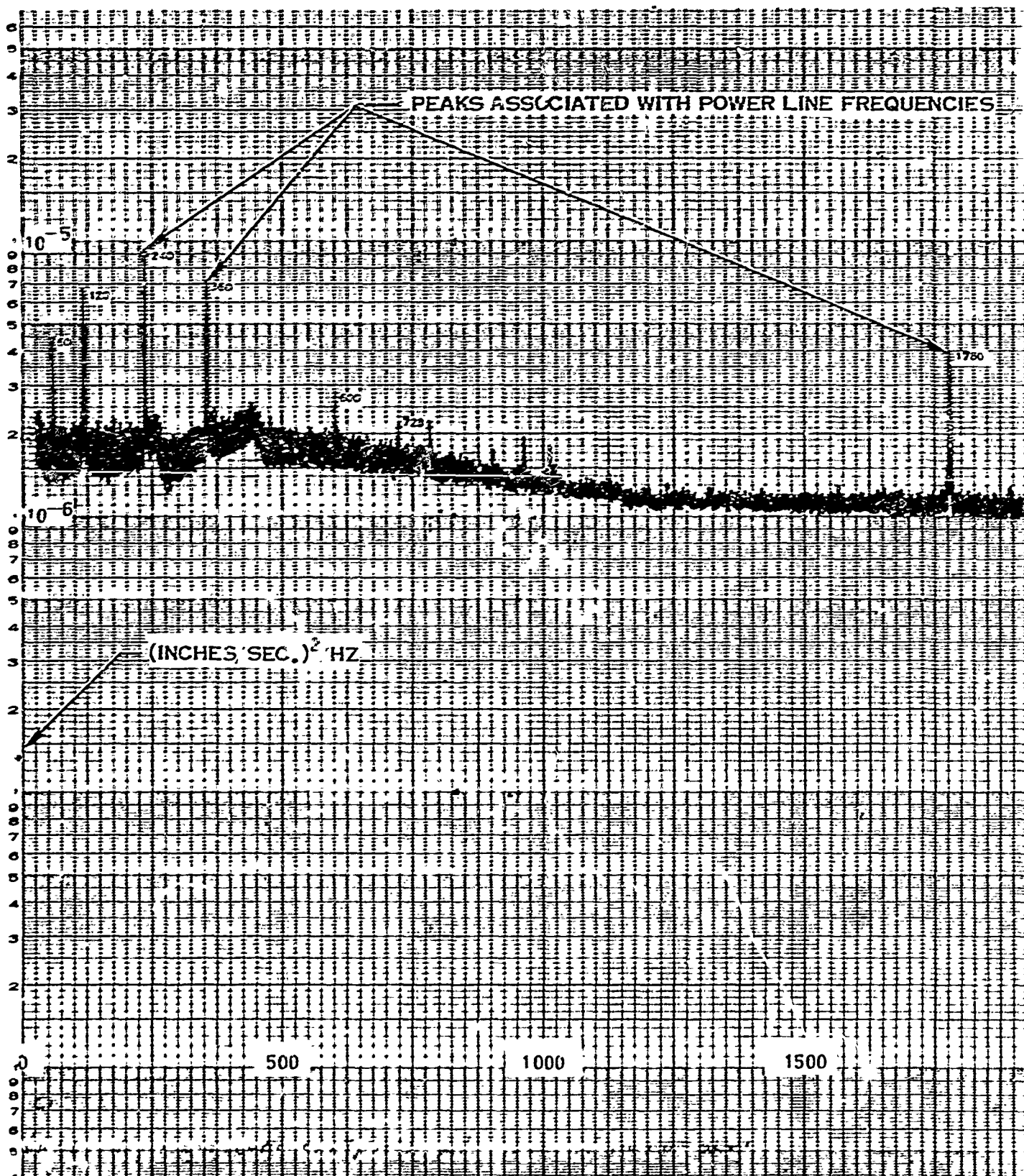
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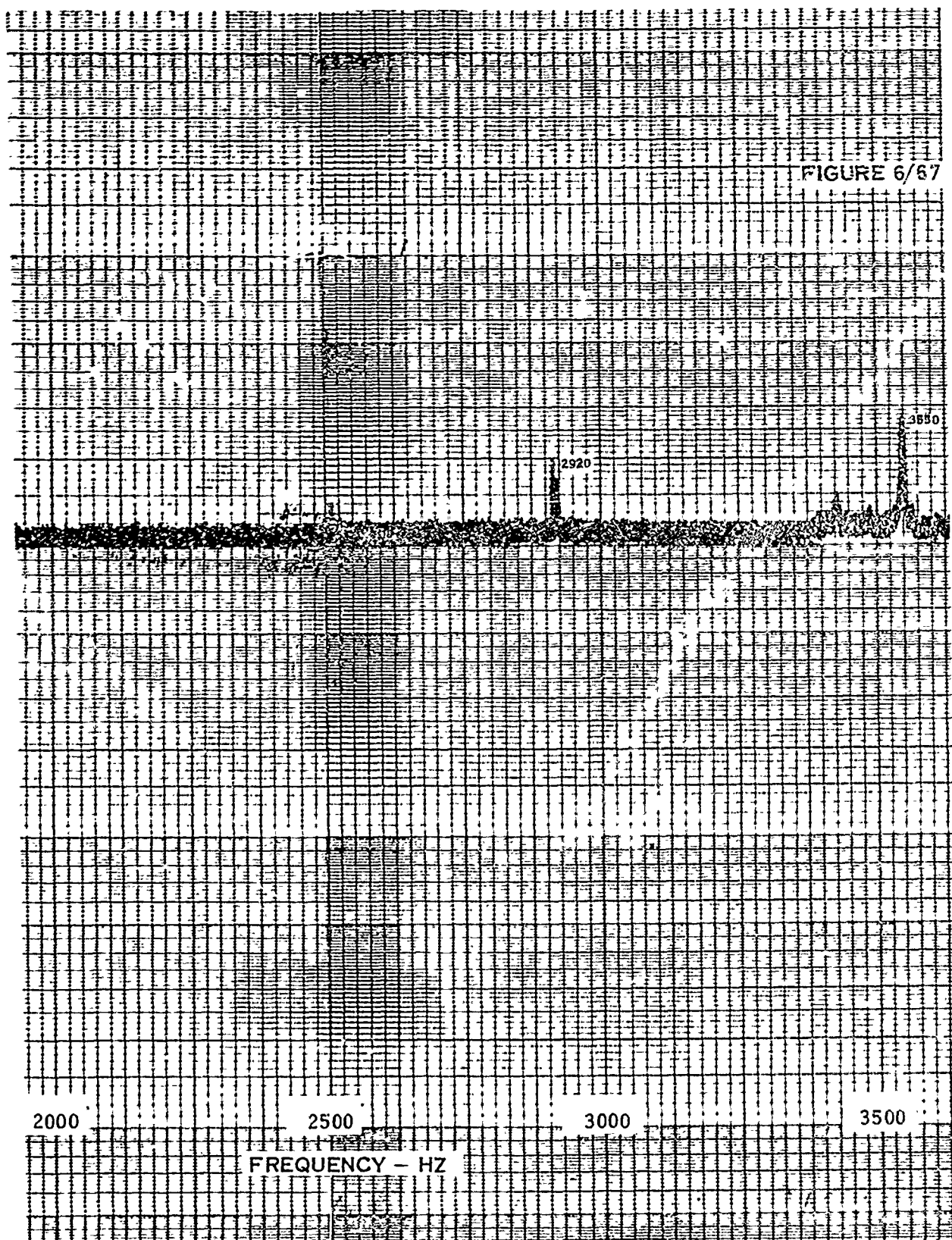
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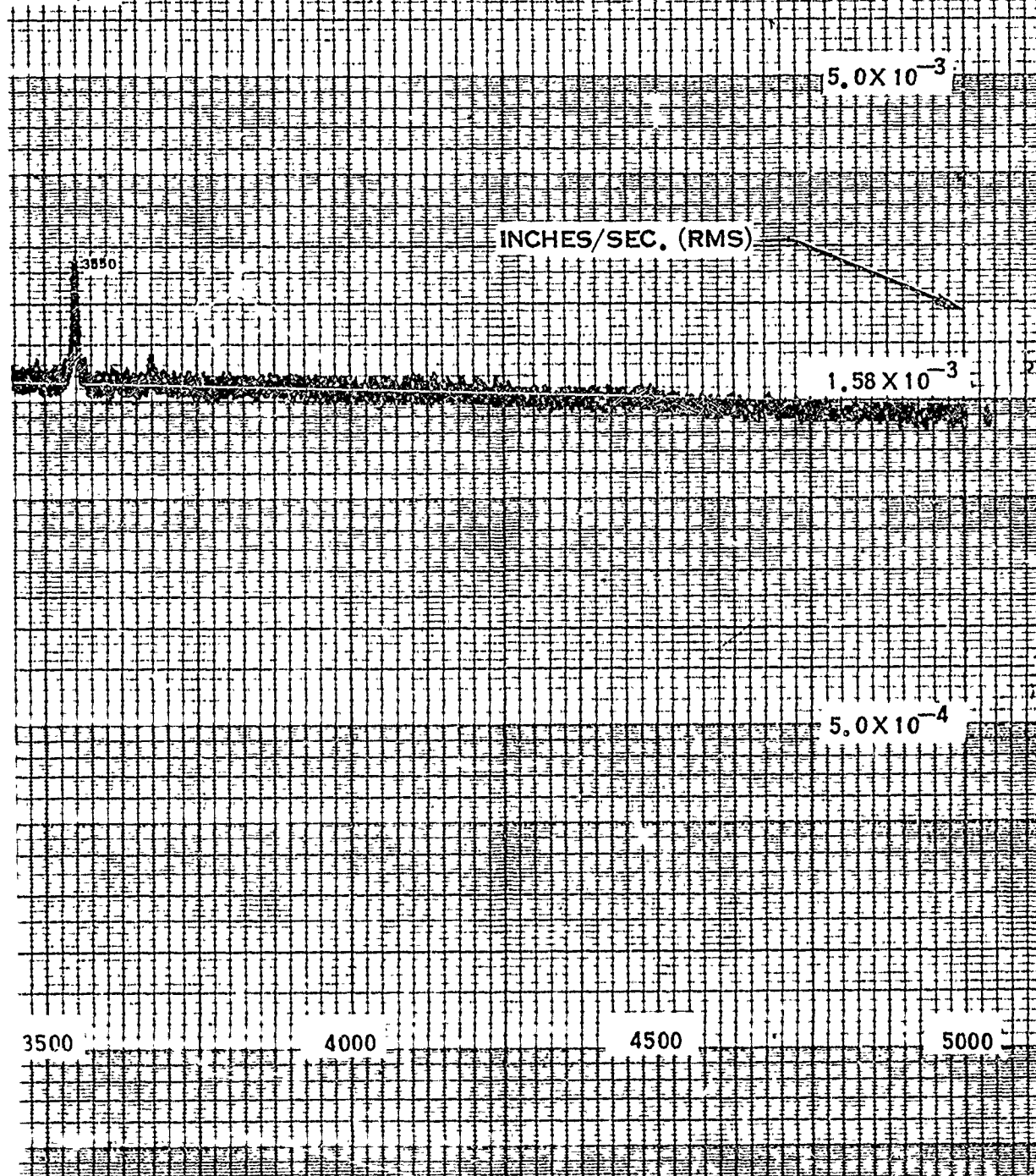
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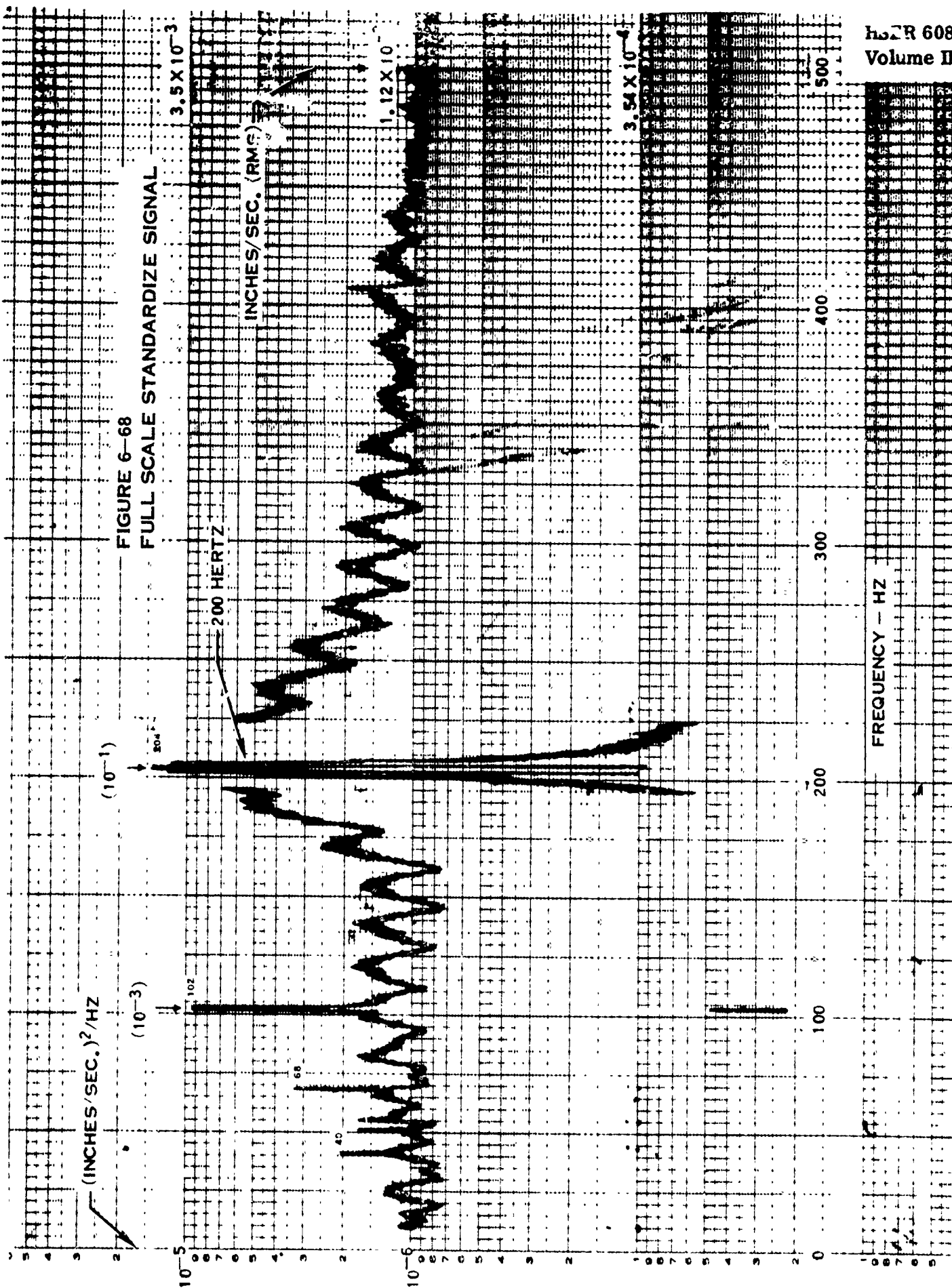
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URE 6/67 SPRECTRUM ANALYSIS OF ZERO STANDARDIZE RECORD





## AIDAPS - Test Cell Phase Summary -400 rpm ± 8600 i.e. i.e.

Part Name	Number Tested	Part Number	Part Serial No.	Component Serial Number	Description of Defective Part	4 σ exceedances parameter number	Run No.
engine	10	T53-L-13	---	LE-15-15 LE-1455 LE-21173 LE-18732 LE-14552 LE-18107 LE-15351 LE-18993 LE-18257 LE-20727	good	0	119 140 153 160 175 183 191 194
#2 main bearing	3	1-300-176-01	584 925 5724	LE-15-15 ↓ LE-20727	pitted outer race, pitted rollers, .0002 excess end wear pitted outer race, pitted & grooved rollers, .0004 end wear N.A.	16 9 10	73 48 20
#3 main bearing	3	1-300-176-01	235 2967 1164	LE-20727 ↓ LE-15351	pitted rollers, .0002 excess end wear pitted outer race, .0002 excess end wear pitted outer race, pitted rollers, .0004 excess end wear	14 29 10	83 95 33
#4 main bearing	3	1-300-015-04	393L 5257 984C	LE-15351 ↓ LE-15615	pitted outer race, pitted balls, .0002 excess int. clearance pitted outer race, pitted balls, .0002 excess int. clearance corrosive pitted balls, .0004 excess int. clearance	14 28 18	62 40 90
compressor	2	1-100-720-18	M42476 M40543	LE-15615 ↓ LE-20727	extreme damage less severe damage	16 15	148 203
power turbine	2	N.A.	3888 M63654	LE-20727 ↓ LE-18993	N.A. N.A.	4 2	126 169
N1 nozzle	2	N.A.	N.A.	LE-18993 ↓ LE-18993	N.A. N.A.	28 5	69 98
N2 nozzle	2	N.A.	N.A.	LE-18993 ↓ LE-15351	N.A. N.A.	1 41	103 133
fuel control	1	N.A.	N.A.	LE-15351	N.A.	0	112

FIGURE 6-69



# AIDAPS - Test Cell Phase Summary 6-00 rpm ± 1.5% torque

Part Name	Number Tested	Part Number	Defective Part Serial Number	Component Serial Number	Description of Defective Part	# 45	# 125	# 47	# 123	# 49	# 126	# 129	Run No.
transmission	15	204-040-01-1	--	A12-410E	good	0	-0	0	0	0	0	0	1A
				B12-1424									11
				A12-2655A									16
				A12-4122									20
				B12-198									24
				A12-4214									29
				ABU-11153									35
				ABU-1184C									42
				B12-003									51
				A12-2653									57
				A12-1013A									369
				A12-59B									563
				B12-999B									547
				B12-621B									571
				A12-258B									575
main mast bell bearing	6	204-040-13-7	854E	ABU-11153	rust pitted balls & outer race	11	6	--	4	3	5	0	166
				ABU-11153		6	--8	--	7	4	2	6	170
				ABU-11153	rust pits, flaking on balls, inner & outer race	8	7	--	14	7	2	6	186
				ABU-11153		6	5	--	17	3	7	2	190
				ABU-11153		7	10	9	19	5	8	4	136
sun gears, upper	3	204-040-330-3	A12-6197	ABU-11153	excessive wear across tip of teeth	4	6	5	15	2	8	3	140
				ABU-11153		9	7	2	10	--	--	--	449
				A12-6197	light metal indentations on all teeth	0	1	0	0	--	--	--	493
				A12-9059	metal breakout on some teeth, heavy wear	11	7	0	12	--	--	--	497
				B12-4837									501
pinion planetary, upper and lower	4	204-040-102-7	B12-14247 & A12-3406	A12-4214	excessive wear near base of teeth	7	12	4	0	--	--	--	489
				ABU-11153	metal indentations	17	10	5	6	--	--	--	493
				B12-2603	spalling on edge of gear teeth	8	10	2	0	--	--	--	497
				B12-14028 & B12-4022	excessive wear on gear teeth	6	8	1	1	--	--	--	501
				?									

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Volume II

FIGURE 6-70A

Part Name	Number Tested	Part Number	Defective Part Serial Number	Component Serial Number	Description of Defective Part	# 45	# 125	# 47	# 123	# 49	# 126	Run No.
transmission - continued input quill ball bearing	10	204-040-345-3	3205	A12-2655A	pitted outer end inner races	5	--	1	1	5	6	175
			9559	A12-4214	rusty, pitted balls and outer races	4	2	7	6	16	80	188
			1846	ABU-11153	rusty balls and grooved inner race	2	4	1	2	4	5	213
			460	ABU-11846	rusty balls and grooved inner race	7	6	--	6	12	10	217
			1610	A12-2655A	rusty balls and outer race	7	4	2	4	9	8	231
			12350	A12-4214	rusty pitted balls and inner race	1	2	0	0	12	13	285
			J411	A12-4214	rusty pitted balls and outer race	2	1	2	4	9	14	298
			13728	A12-2655A	pitted inner & outer race	1	1	1	4	4	7	256
			6753	ABU-11153	pitted balls inner & outer races	3	1	3	4	6	6	260
			K1562	A12-4214	cut balls, pitted outer & inner races	--	--	--	--	8	17	332
accessory drive gears	4	204-040-762-1	F12-145	A12-4214	rust pitting on some teeth	--	1	--	--	--	28	528
			B12-1807	ABU-11153	spalling on gear teeth heavy wear on one end of teeth	--	2	--	--	--	4	511
			B12-1450	A12-2655A	spalling	--	9	--	--	--	12	535
			A12-592	ABU-11846	rust pitted inner race	--	0	--	--	--	11	539
			101485	ABU-11846	rust pitted inner race	--	--	--	--	12	16	595
			116550	A12-4214	pitted inner race	--	--	--	--	13	14	613
			115840	ABU-11153	pitted inner race	--	--	--	--	0	9	617
			133687	A12-2655A	pitted inner race	--	--	--	--	15	11	621
			28261	ABU-11846	corrosive pitted inner race & rollers	--	--	--	--	17	4	625
			159477	ABU-11846	pitted inner race, groove pitted rollers	--	--	--	--	13	3	641
tail rotor quill roller bearing	6	204-040-310-1	101485	ABU-11846	rust pitted inner race	--	--	--	--	12	16	595
			116550	A12-4214	pitted inner race	--	--	--	--	13	14	613
			115840	ABU-11153	pitted inner race	--	--	--	--	0	9	617
			133687	A12-2655A	pitted inner race	--	--	--	--	15	11	621
			28261	ABU-11846	corrosive pitted inner race & rollers	--	--	--	--	17	4	625
			159477	ABU-11846	pitted inner race, groove pitted rollers	--	--	--	--	13	3	641
			7510K	ABU-11846	corrosive pitted & scored balls	7	3	2	3	16	31	868
			6234H	A12-2655A	pitted balls and outer race	0	5	2	1	4	6	892
			9797G	A12-4214	corrosive pitted balls & outer races	3	3	4	6	7	21	896
			7145E	ABU-11153	pitted balls	1	3	1	2	1	11	900
tail rotor quill ball bearing	11	204-040-143-1	2506D	ABU-11846	pitted & scored balls & outer races	14	8	10	0	13	22	904
			7159E	ABU-11153	corrosive pitting on balls, inner & outer races	--	--	--	--	3	6	936
			72311	A12-2655A	rust pitted balls & outer race	--	--	--	--	6	7	940
			470K	ABU-11846	rust pitted balls & outer race	--	--	--	--	10	12	944
			69599	A12-4214	rust pitted balls & outer race	--	--	--	--	30	78	973
			38124	ABU-11153	rust pitted balls & outer race	--	--	--	--	3	6	977
			44282	A12-2655A	rust pitted balls & outer race	--	--	--	--	12	8	981
						--	--	--	--	--	--	
						--	--	--	--	--	--	
						--	--	--	--	--	--	

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Volume II

FIGURE 6-708

Part Name	Number Tested	Part Number	Defective Part Serial Number	Component Serial Number	Description of Defective Part	# of # 1's	# of # 2's	# of extenders	programmer number	Rt. No.
high time before overhaul	4									
sun gear		204-040-530-3	A12-4348	A12-759	heavy wear	0	65	\$ 123	\$ 49	W 125
tall rotor gear		204-040-103-7	A12-2661	A12-759	heavy wear on teeth	0	21	1'	1B	" "
planetary pinion roller bearing		204-040-725-3	N.A.	A12-759	2 missing rollers					
upper sun gear		204-040-330-3	A12-7105	D12-621	worn gear teeth	3	38	" "	35	" "
upper pinion gears		204-040-108-7	N.A.	D12-621	spalled and worn teeth					93
roller bearings		204-040-725-1	N.A.	D12-621	nicked and grooved					93
upper sun gear		204-040-330-3	F12-1832	D12-999	chipped teeth	0	8	" "	36	1"
input pinion		204-040-700-1	A12-0932	D12-999	rust and pitting on inner race					93
lower sun gear		204-040-329-1	D12-2406	D12-999	heavy wear					93
accessory drive bearing		204-040-135-1	N.A.	D12-999	rough, rusty and pitted					93
bearing		204-040-142-1	N.A.	D12-999	rough, rusty and pitted					93
input pinion		204-040-700-1	A12-649	A12-250	pitting on inboard bearing race	11	6	" "	20	" "
inner clutch race		204-040-190-7	A12-502	A12-250	excessive pitting					100
sun gear		204-040-336-1	D12-2950	A12-250	obsolete					100

**SECRET, GPO**  
**Release 32**

4 or extended parameter number				AIR No.	
# 45	# 125	# 47	# 123	# 124	# 129
8, 67-69, 81, 82, 102, 103, 108-110	68, 69, 102, 109, 133, 218	--	109, 120, 294, 339	13, 17, 109, 294, 332	7-9, 13, 76, 177, 332, 333
60, 69, 76, 102, 103, 109	68, 69, 109, 133, 215, 219, 245	--	120, 133, 134, 297, 298, 339, 340	109, 283	76, 86, 177, 178, 333, 334
67-69, 86, 102, 103, 109, 110	68, 109, 110, 133, 215, 245, 246	--	64-70, 120, 129, 133, 140, 153-155	105, 109	19, 20, 177, 178, 333, 334
67, 68, 102, 103, 109, 110	109, 110, 133, 137, 215	--	65-71, 120, 129, 140-155	105, 106, 108, 109, 198, 333, 334	2
67-69, 85, 102, 103, 109, 110	68, 102, 109, 114, 58, 62-67, 109, 133, 137, 172, 211 245, 246, 260	9	50, 59, 61-69, 120, 140, 150, 161, 211, 312, 333 150-155	105, 109, 109, 120, 177, 178, 283, 290, 333	4 76, 177, 319, 333
67, 68, 102, 103	68, 102, 103, 133, 172, 245	5	45, 49, 64-69, 72, 76, 124, 128, 129, 140, 149, 152, 153	102, 103, 105-107, 109, 160, 177	3 76, 177, 133
40, 80, 84, 107, 34, 120, 140, 205, 206, 233	40, 41, 120, 84, 85 205, 206, 239	2	67, 64, 100, 101, 121, 205, 206, 289, 290, 291	--	--
0	41	0	0	--	--
7, 8, 14, 120, 121, 154, 177, 178, 205, 206, 243	8, 41, 79, 120, 121, 205, 206 50, 79, 206	7	41, 42, 49, 50, 79, 150, 121, 164, 205, 206, 289, 290	--	--

FIGURE 6-70D



$\nu$	45	$\nu$	125	$\nu$	4	4	0	exceedence parameter number	$\nu$	40	$\nu$	124	$\nu$	129	Page No.
105, 107, 124, 133, 141, 255, 270	7	105, 107, 133, 141, 255, 270	4	105, 107, 270, 270	1	105, 107, 270, 270	1	105, 107, 270, 270	1	105, 107, 270, 270	1	105, 107, 270, 270	1	105, 107, 270, 270	221
258	1	41, 123	2	90, 92, 101, 209, 257, 294, 309, 339	1	90, 92, 101, 209, 257, 294, 309, 339	1	90, 92, 101, 209, 257, 294, 309, 339	1	90, 92, 101, 209, 257, 294, 309, 339	1	90, 92, 101, 209, 257, 294, 309, 339	1	90, 92, 101, 209, 257, 294, 309, 339	225
123, 258	2	123	1	292, 294, 309, 339	1	292, 294, 309, 339	1	292, 294, 309, 339	1	292, 294, 309, 339	1	292, 294, 309, 339	1	292, 294, 309, 339	252
123	1	123	1	210, 214, 307	1	210, 214, 307	1	210, 214, 307	1	210, 214, 307	1	210, 214, 307	1	210, 214, 307	255
7-9	3	133	1	2, 109, 110, 290	1	2, 109, 110, 290	1	2, 109, 110, 290	1	2, 109, 110, 290	1	2, 109, 110, 290	1	2, 109, 110, 290	256
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	332
--	--	149	1	--	--	--	--	--	--	--	--	--	--	--	528
--	--	64, 120	2	--	--	--	--	--	--	--	--	--	--	--	531
--	--	79, 120, 163-165, 205, 206, 240, 331	9	--	--	--	--	--	--	--	--	--	--	--	535
--	--	71, 79, 80, 126, 175, 205, 206, 259	8	--	--	--	--	--	--	--	--	--	--	--	539

FIGURE 6-70F

# 45	# 125	# 47	# 123	# 127	# 129	Page No.
--	--	--	--	12 <sup>16</sup>	--	384
--	--	--	--	3, 4, 84, 120, 240, 270, 274, 310-312	3, 4, 122, 103, 105, 107-109, 204, 207, 224, 227, 301, 325, 326	413
--	--	--	--	2, 31, 41, 116, 119, 120, 204, 205, 229, 230, 230-240	3, 41, 116, 119, 122, 204, 205, 229, 230, 231, 232-240	417
--	--	--	--	2, 41, 120, 149, 156, 157, 204, 240	3, 40, 41, 47, 50-53, 240	421
--	--	--	--	2, 31, 32, 41, 50, 119, 120, 181, 182, 204-206, 230-240	31, 32, 41, 53, 119, 120, 204, 205, 230-240	425
--	--	--	--	2-4, 31, 50, 84, 120, 103, 104, 240, 241, 269, 273, 274, 277, 310, 311	32, 40, 47, 204	461
--	--	--	--	3, 4, 84, 120, 182, 183, 240, 269, 273, 278, 309, 310	71, 120, 204	228
80, 81, 85, 86, 123, 126, 176	127, 128	127, 128	210, 204, 205	4, 37, 38, 91, 123, 234, 235, 244, 249, 251, 270, 304, 305, 315, 327, 328	37-39, 46, 47, 102, 104, 105, 108, 109, 122, 123, 141, 164, 203, 212, 214, 219, 220, 231, 234, 235, 245, 250, 251, 254, 257, 258, 273, 301, 304-305, 315, 316	292
123, 126, 176	127, 128	127, 128	210, 204, 205	124, 211, 240, 247	123, 124, 237, 246, 247, 327	296
105, 123, 238	105, 106, 123	85, 86, 105, 106	2, 105, 106, 210, 234, 204	110, 123, 234-236, 244, 245	105, 106, 109, 113, 114, 122, 123, 128, 150, 151, 159, 203, 225, 234, 236, 240, 244, 245, 246, 248	295

FIGURE 6-700

FIGURE 6-700

**HSER 6080**  
**Volume II**





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**FIGURE 6-71A**

# AIDAPS - Test Cell Phase Summary

Part Name	Number Tested	Part Number	Part Serial Number	Component Serial Number	Description of Defective Part	# of Exceedances Parameter No.	Run No.
High time before overhaul							
input roller bearing	204-040-310-1	9173		B13-2970	pitted race	59	61
output roller bearing	204-040-310-1	11322		B13-2970	pitted race	--	6
output ball bearing	204-040-143-1	47225		A13-554	rough	--	9
input roller bearing	204-040-310-1	10090		A13-554	pitted race	--	107
output ball bearing	204-040-143-1	7940E		B13-5572	rusty balls	--	5
output bevel gear	204-040-500-10	N.A.		B13-4023	N.A.	--	3
output roller bearing	204-040-310-1	10102		B13-4023	rusty, pitted inner race & rollers		115
input roller bearing	204-040-310-1	11594E		B13-4023	pitted race		115
input ball bearing	204-040-143-1			B13-4023	rusty balls		115

FIGURE 6-71B

HSER 6060  
Volume II

4. # exceedances/parameter number	#	Run No.
81, 138, 139, 147, 154, 161, 172, 173, 185, 194, 208, 215, 287-289, 299, 300, 310-312, 333, 334	22 61	274
147, 148, 162, 173, 185, 196, 220, 266, 289, 300, 311, 312, 323, 324	14 15	278
65, 66, 81, 85, 87, 92, 147, 156, 157, 161, 162, 172, 173, 194, 220, 238, 254, 265, 266, 276, 277, 288, 289, 299, 300, 310-312, 326, 334	30 41	282
44, 65, 87, 92, 103, 115, 138, 146, 147, 160, 161, 171-173, 184, 195, 196, 217, 252, 263-266, 286, 298, 308-310	28 20	286
65, 91, 92, 103, 137, 138, 145, 146, 170-172, 193-195, 205, 216, 217, 262, 265, 285, 286, 296, 306-309	26 42	322
138, 146, 147, 150, 160, 161, 171-173, 183-185, 194-196, 205-207, 217, 218, 229, 252, 266, 275, 286, 298, 308-310	29 32	326

FIGURE 6-71C

Run No.	4 0 exceedances/parameter number # 59	# 1
314	<sup>34</sup> 65, 66, 78, 85, 87, 92, 138, 147, 150, 155, 18, 19, 27, 37, 46, 47, 59, 60, 64, 65, 161, 162, 172, 173, 184, 185, 195-197, 204, 207, 208, 220-231, 254, 276, 277, 299, 300, 310-312, 323, 334	<sup>66</sup> 12, 13, 135, 136, 139, 142-145, 148, 203, 235, 240, 249, 295
351	<sup>17</sup> 145, 150, 172, 188, 200, 211, 223, 246, 257, 258, 281, 292-294, 304, 305, 316	<sup>15</sup> 106, 109, 127, 164, 165, 169, 183, 188, 197, 211, 225, 235, 239, 240, 253, 323
355	<sup>18</sup> 80, 141, 150, 176, 177, 188, 211, 223, 258, 281, 282, 292-294, 304, 305, 316, 317	<sup>25</sup> 70, 97, 118, 142, 165, 169, 174, 188, 207, 216, 221, 235, 239, 240, 253, 254, 267, 277, 286, 300, 305, 323, 324, 332, 333
359	<sup>20</sup> 150, 153, 154, 188, 196, 200, 208, 211, 223, 246, 281, 282, 293, 294, 304, 305, 306, 316, 317, 329	<sup>36</sup> 45, 81, 92, 94, 95, 109, 113, 114, 118, 123, 138, 148, 160, 161, 174, 188, 207, 211, 216, 221, 230, 235, 244, 249, 253, 254, 258, 259, 264, 265, 272, 286, 287, 300, 301, 333
363	<sup>12</sup> 80, 150, 161, 165, 177, 188, 211, 223, 281, 282, 316, 317	<sup>5</sup> 127, 142, 197, 253, 319
395	<sup>20</sup> 3, 147, 162, 173, 184-186, 196, 197, 208, 209, 231, 232, 265, 266, 277, 289, 300, 311, 312	<sup>32</sup> 37, 59, 60, 65, 69, 70, 93, 96, 97, 107, 120, 124, 125, 139, 157, 166, 167, 185, 189, 190, 193, 194, 203, 245, 250, 264, 282, 295, 296, 318, 319, 328
399	<sup>26</sup> 57, 93, 115, 139, 147-149, 162, 172-175, 184, 185, 197, 208, 209, 220, 239, 255, 266, 289, 300, 301, 312, 324	<sup>15</sup> 46, 47, 59, 70, 96, 97, 120, 124, 125, 181, 194, 195, 249, 250, 333
147	<sup>18</sup> 26, 49, 85, 145, 180, 181, 204, 205, 257, 289, 300, 322-325, 335-337	<sup>23</sup> 7, 54, 55, 59, 100, 103, 130, 135, 144, 157, 188, 201-203, 267, 221, 259-261, 264, 265, 327, 328
151	<sup>13</sup> 38, 50, 61, 180, 205, 254, 257, 258, 323-325, 338	<sup>18</sup> 55, 58, 59, 78, 83, 130, 179, 212, 213, 259-261, 285, 294, 295, 308, 309, 333

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FIGURE 6-71D :

4 σ exceedances/parameter number # 59	# 1	Run No.
7, 9, 37, 38, 60, 61, 73, 180, 203, 204, 215, 228, 255, 287, 299, 300, 322-324, 335	20 53, 54, 58, 59, 87, 101-103, 120, 130, 134, 135, 144, 157, 178, 183, 188, 202, 235, 258-260, 264, 268	155
5, 6, 49, 69, 73, 85, 145, 180, 192, 193, 204, 205, 215, 217, 228, 229, 240, 252, 253, 276, 277, 287, 288, 289, 299, 300, 322-325, 336	31 47, 49, 53, 58, 59, 64, 82, 83, 87, 88, 103-106, 111, 115, 116, 120, 130, 135, 139, 150, 151, 157, 178, 179, 183, 202, 207, 211, 212, 216, 221, 226, 240, 258- 260, 264-266, 270-272, 307, 308, 341	159
15, 154, 155, 166, 167, 178-180, 201-203, 320-322	14 81, 82, 134, 138, 162, 166, 175, 176, 208, 209, 289, 290, 303, 304, 313, 327, 328	187
146, 147, 160, 161, 202, 261, 319, 320, 331, 332	11 109, 110, 138, 166, 200, 265, 327	191
9, 78, 87, 92, 138, 146, 147, 161, 168, 169, 171-173, 180, 184, 185, 195, 196, 202-204, 207, 208, 266, 275-277, 286-288, 298, 299, 309-311	35 37, 51, 55, 59, 69, 70, 96, 119, 120, 123, 124, 125, 134, 143, 165, 166, 182, 183, 188, 193, 216, 221, 222, 230, 235, 239, 243, 244, 247-249	310
--	6 17, 105, 148, 193, 272, 341	103
--	9 101, 102, 114, 119, 120, 289, 303, 308, 336	107
--	5 36, 100, 101, 303, 341	111
--	3 259, 260, 287	115

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FIGURE 6-71E

AIDAPS - Test Cell Phase Summary				400 RPM 5 inch dia. 11.5			
Part Name	Number Tested	Part Number	Defective Part	Serial Number	Component	Serial Number	Run No.
90° gearbox	12	204-040-012-13	good	ABC-015	ABC-015	63	66
				A13-206	A13-206	67	
				B13-042	B13-042	71	
				ABC-142	ABC-142	75	
				A13-272	A13-272	79	
				B13-206	B13-206	119	
				A13-217	A13-217	201	
				ABC-332	ABC-332	207	
				B13-042	B13-042	245	
				B13-042	B13-042	249	
				B13-100	B13-100	253	
				B13-100	B13-100	257	
input roller bearings	6	204-040-406-1	pitted roller, fatigue pitted outer race	ABC-142	ABC-142	147	
				A13-206	A13-206	151	
				18083	18083	155	
				2011	2011	159	
				15799	15799	167	
				13322	13322	191	
output roller bearing	6	204-040-407-1	fatigue pitted outer race & rollers	ABC-142	ABC-142	274	
				A13-272	A13-272	278	
				B13-042	B13-042	282	
				22283	22283	286	
				22032	22032	290	
				15392	15392	294	
input ball bearing	6	204-040-413-1	rusty pitted balls & outer races	A13-206	A13-206	195	
				B13-042	B13-042	199	
				86470	86470	203	
				80178	80178	207	
				18124	18124	211	
				91720	91720	215	
output ball bearing	6	204-040-424-1	rough, rusty pitted outer race & balls	A13-206	A13-206	310	
				ABC-142	ABC-142	314	
				B13-042	B13-042	318	
				10586	10586	322	
				6378	6378	326	

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FIGURE 6-72A

AIDAPS - Test-Tail Phase Summary

Part Name	Number Tested	Part Number

part#:200-x041028 006

400 RPT 1 3-6-68 1:12  
Defective For: Component:  
Serial Number: Serial Number

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12 ascendances for aster number run no.  
64 66

Input/output gears	12	204-040-101--	(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)	(41)	(42)	(43)	(44)	(45)	(46)	(47)	(48)	(49)	(50)	(51)	(52)	(53)	(54)	(55)	(56)	(57)	(58)	(59)	(60)	(61)	(62)	(63)	(64)	(65)	(66)	(67)	(68)	(69)	(70)	(71)	(72)	(73)	(74)	(75)	(76)	(77)	(78)	(79)	(80)	(81)	(82)	(83)	(84)	(85)	(86)	(87)	(88)	(89)	(90)	(91)	(92)	(93)	(94)	(95)	(96)	(97)	(98)	(99)	(100)	(101)	(102)	(103)	(104)	(105)	(106)	(107)	(108)	(109)	(110)	(111)	(112)	(113)	(114)	(115)	(116)	(117)	(118)	(119)	(120)	(121)	(122)	(123)	(124)	(125)	(126)	(127)	(128)	(129)	(130)	(131)	(132)	(133)	(134)	(135)	(136)	(137)	(138)	(139)	(140)	(141)	(142)	(143)	(144)	(145)	(146)	(147)	(148)	(149)	(150)	(151)	(152)	(153)	(154)	(155)	(156)	(157)	(158)	(159)	(160)	(161)	(162)	(163)	(164)	(165)	(166)	(167)	(168)	(169)	(170)	(171)	(172)	(173)	(174)	(175)	(176)	(177)	(178)	(179)	(180)	(181)	(182)	(183)	(184)	(185)	(186)	(187)	(188)	(189)	(190)	(191)	(192)	(193)	(194)	(195)	(196)	(197)	(198)	(199)	(200)	(201)	(202)	(203)	(204)	(205)	(206)	(207)	(208)	(209)	(210)	(211)	(212)	(213)	(214)	(215)	(216)	(217)	(218)	(219)	(220)	(221)	(222)	(223)	(224)	(225)	(226)	(227)	(228)	(229)	(230)	(231)	(232)	(233)	(234)	(235)	(236)	(237)	(238)	(239)	(240)	(241)	(242)	(243)	(244)	(245)	(246)	(247)	(248)	(249)	(250)	(251)	(252)	(253)	(254)	(255)	(256)	(257)	(258)	(259)	(260)	(261)	(262)	(263)	(264)	(265)	(266)	(267)	(268)	(269)	(270)	(271)	(272)	(273)	(274)	(275)	(276)	(277)	(278)	(279)	(280)	(281)	(282)	(283)	(284)	(285)	(286)	(287)	(288)	(289)	(290)	(291)	(292)	(293)	(294)	(295)	(296)	(297)	(298)	(299)	(300)	(301)	(302)	(303)	(304)	(305)	(306)	(307)	(308)	(309)	(310)	(311)	(312)	(313)	(314)	(315)	(316)	(317)	(318)	(319)	(320)	(321)	(322)	(323)	(324)	(325)	(326)	(327)	(328)	(329)	(330)	(331)	(332)	(333)	(334)	(335)	(336)	(337)	(338)	(339)	(340)	(341)	(342)	(343)	(344)	(345)	(346)	(347)	(348)	(349)	(350)	(351)	(352)	(353)	(354)	(355)	(356)	(357)	(358)	(359)	(360)	(361)	(362)	(363)	(364)	(365)	(366)	(367)	(368)	(369)	(370)	(371)	(372)	(373)	(374)	(375)	(376)	(377)	(378)	(379)	(380)	(381)	(382)	(383)	(384)	(385)	(386)	(387)	(388)	(389)	(390)	(391)	(392)	(393)	(394)	(395)	(396)	(397)	(398)	(399)	(400)	(401)	(402)	(403)	(404)	(405)	(406)	(407)	(408)	(409)	(410)	(411)	(412)	(413)	(414)	(415)	(416)	(417)	(418)	(419)	(420)	(421)	(422)	(423)	(424)	(425)	(426)	(427)	(428)	(429)	(430)	(431)	(432)	(433)	(434)	(435)	(436)	(437)	(438)	(439)	(440)	(441)	(442)	(443)	(444)	(445)	(446)	(447)	(448)	(449)	(450)	(451)	(452)	(453)	(454)	(455)	(456)	(457)	(458)	(459)	(460)	(461)	(462)	(463)	(464)	(465)	(466)	(467)	(468)	(469)	(470)	(471)	(472)	(473)	(474)	(475)	(476)	(477)	(478)	(479)	(480)	(481)	(482)	(483)	(484)	(485)	(486)	(487)	(488)	(489)	(490)	(491)	(492)	(493)	(494)	(495)	(496)	(497)	(498)	(499)	(500)	(501)	(502)	(503)	(504)	(505)	(506)	(507)	(508)	(509)	(510)	(511)	(512)	(513)	(514)	(515)	(516)	(517)	(518)	(519)	(520)	(521)	(522)	(523)	(524)	(525)	(526)	(527)	(528)	(529)	(530)	(531)	(532)	(533)	(534)	(535)	(536)	(537)	(538)	(539)	(540)	(541)	(542)	(543)	(544)	(545)	(546)	(547)	(548)	(549)	(550)	(551)	(552)	(553)	(554)	(555)	(556)	(557)	(558)	(559)	(560)	(561)	(562)	(563)	(564)	(565)	(566)	(567)	(568)	(569)	(570)	(571)	(572)	(573)	(574)	(575)	(576)	(577)	(578)	(579)	(580)	(581)	(582)	(583)	(584)	(585)	(586)	(587)	(588)	(589)	(590)	(591)	(592)	(593)	(594)	(595)	(596)	(597)	(598)	(599)	(600)	(601)	(602)	(603)	(604)	(605)	(606)	(607)	(608)	(609)	(610)	(611)	(612)	(613)	(614)	(615)	(616)	(617)	(618)	(619)	(620)	(621)	(622)	(623)	(624)	(625)	(626)	(627)	(628)	(629)	(630)	(631)	(632)	(633)	(634)	(635)	(636)	(637)	(638)	(639)	(640)	(641)	(642)	(643)	(644)	(645)	(646)	(647)	(648)	(649)	(650)	(651)	(652)	(653)	(654)	(655)	(656)	(657)	(658)	(659)	(660)	(661)	(662)	(663)	(664)	(665)	(666)	(667)	(668)	(669)	(670)	(671)	(672)	(673)	(674)	(675)	(676)	(677)	(678)	(679)	(680)	(681)	(682)	(683)	(684)	(685)	(686)	(687)	(688)	(689)	(690)	(691)	(692)	(693)	(694)	(695)	(696)	(697)	(698)	(699)	(700)	(701)	(702)	(703)	(704)	(705)	(706)	(707)	(708)	(709)	(710)	(711)	(712)	(713)	(714)	(715)	(716)	(717)	(718)	(719)	(720)	(721)	(722)	(723)	(724)	(725)	(726)	(727)	(728)	(729)	(730)	(731)	(732)	(733)	(734)	(735)	(736)	(737)	(738)	(739)	(740)	(741)	(742)	(743)	(744)	(745)	(746)	(747)	(748)	(749)	(750)	(751)	(752)	(753)	(754)	(755)	(756)	(757)	(758)	(759)	(760)	(761)	(762)	(763)	(764)	(765)	(766)	(767)	(768)	(769)	(770)	(771)	(772)	(773)	(774)	(775)	(776)	(777)	(778)	(779)	(780)	(781)	(782)	(783)	(784)	(785)	(786)	(787)	(788)	(789)	(790)	(791)	(792)	(793)	(794)	(795)	(796)	(797)	(798)	(799)	(800)	(801)	(802)	(803)	(804)	(805)	(806)	(807)	(808)	(809)	(810)	(811)	(812)	(813)	(814)	(815)	(816)	(817)	(818)	(819)	(820)	(821)	(822)	(823)	(824)	(825)	(826)	(827)	(828)	(829)	(830)	(831)	(832)	(833)	(834)	(835)	(836)	(837)	(838)	(839)	(840)	(841)	(842)	(843)	(844)	(845)	(846)	(847)	(848)	(849)	(850)	(851)	(852)	(853)	(854)	(855)	(856)	(857)	(858)	(859)	(860)	(861)	(862)	(863)	(864)	(865)	(866)	(867)	(868)	(869)	(870)	(871)	(872)	(873)	(874)	(875)	(876)	(877)	(878)	(879)	(880)	(881)	(882)	(883)	(884)	(885)	(886)	(887)	(888)	(889)	(890)	(891)	(892)	(893)	(894)	(895)	(896)	(897)	(898)	(899)	(900)	(901)	(902)	(903)	(904)	(905)	(906)	(907)	(908)	(909)	(910)	(911)	(912)	(913)	(914)	(915)	(916)	(917)	(918)	(919)	(920)	(921)	(922)	(923)	(924)	(925)	(926)	(927)	(928)	(929)	(930)	(931)	(932)	(933)	(934)	(935)	(936)	(937)	(938)	(939)	(940)	(941)	(942)	(943)	(944)	(945)	(946)	(947)	(948)	(949)	(950)	(951)	(952)	(953)	(954)	(955)	(956)	(957)	(958)	(959)	(960)	(961)	(962)	(963)	(964)	(965)	(966)	(967)	(968)	(969)	(970)	(971)	(972)	(973)	(974)	(975)	(976)	(977)	(978)	(979)	(980)	(981)	(982)	(983)	(984)	(985)	(986)	(987)	(988)	(989)	(990)	(991)	(992)	(993)	(994)	(995)	(996)	(997)	(998)	(999)	(1000)	(1001)	(1002)	(1003)	(1004)	(1005)	(1006)	(1007)	(1008)	(1009)	(1010)	(1011)	(1012)	(1013)	(1014)	(1015)	(1016)	(1017)	(1018)	(1019)	(1020)	(1021)	(1022)	(1023)	(1024)	(1025)	(1026)	(1027)	(1028)	(1029)	(1030)	(1031)	(1032)	(1033)	(1034)	(1035)	(1036)	(1037)	(1038)	(1039)	(1040)	(1041)	(1042)	(1043)	(1044)	(1045)	(1046)	(1047)	(1048)	(1049)	(1050)	(1051)	(1052)	(1053)	(1054)	(1055)	(1056)	(1057)	(1058)	(1059)	(1060)	(1061)	(1062)	(1063)	(1064)	(1065)	(1066)	(1067)	(1068)	(1069)	(1070)	(1071)	(1072)	(1073)	(1074)	(1075)	(1076)	(1077)	(1078)	(1079)	(1080)	(1081)	(1082)	(1083)	(1084)	(1085)	(1086)	(1087)	(1088)	(1089)	(1090)	(1091)	(1092)	(1093)	(1094)	(1095)	(1096)	(1097)	(1098)	(1099)	(1100)	(1101)	(1102)	(1103)	(1104)	(1105)	(1106)	(1107)	(1108)	(1109)	(1110)	(1111)	(1112)	(1113)	(1114)	(1115)	(1116)	(1117)	(1118)	(1119)	(1120)	(1121)	(1122)	(1123)	(1124)	(1125)	(1126)	(1127)	(1128)	(1129)	(1130)	(1131)	(1132)	(1133)	(1134)	(1135)	(1136)	(1137)	(1138)	(1139)	(1140)	(1141)	(1142)	(1143)	(1144)	(1145)	(1146)	(1147)	(1148)	(1149)	(1150)	(1151)	(1152)	(1153)	(1154)	(1155)	(1156)	(1157)	(1158)	(1159)	(1160)	(1161)	(1162)	(1163)	(1164)	(1165)	(1166)	(1167)	(1168)	(1169)	(1170)	(1171)	(1172)	(1173)	(1174)	(1175)	(1176)	(1177)	(1178)	(1179)	(1180)	(1181)	(1182)	(1183)	(1184)	(1185)	(1186)	(1187)	(1188)	(1189)	(1190)	(1191)	(1192)	(1193)	(1194)	(1195)	(1196)	(1197)	(1198)	(1199)	(1200)	(1201)	(1202)	(1203)	(1204)	(1205)	(1206)	(1207)	(1208)	(1209)	(1210)	(1211)	(1212)	(1213)	(1214)	(1215)	(1216)	(1217)	(1218)	(1219)	(1220)	(1221)	(1222)	(1223)	(1224)	(1225)	(1226)	(1227)	(1228)	(1229)	(1230)	(1231)	(1232)	(1233)	(1234)	(1235)	(1236)	(1237)	(1238)	(1239)	(1240)	(1241)	(1242)	(1243)	(1244)	(1245)	(1246)	(1247)	(1248)	(1249)	(1250)	(1251)	(1252)	(1253)	(1254)	(1255)	(1256)	(1257)	(1258)	(1259)	(1260)	(1261)	(1262)	(1263)	(1264)	(1265)	(1266)	(1267)	(1268)	(1269)	(1270)	(1271)	(1272)	(1273)	(1274)	(1275)	(1276)	(1277)	(1278)	(1279)	(1280)	(1281)	(1282)	(1283)	(1284)	(1285)	(1286)	(1287)	(1288)	(1289)	(1290)	(1291)	(1292)	(1293)	(1294)	(1295)	(1296)	(1297)	(1298)	(1299)	(1300)	(1301)	(1302)	(1303)	(1304)	(1305)	(1306)	(1307)	(1308)	(1309)	(1310)	(1311)	(1312)	(1313)	(1314)	(1315)	(1316)	(1317)	(1318)	(1319)	(1320)	(1321)	(1322)	(1323)	(1324)	(1325)	(1326)	(1327)	(1328)	(1329)	(1330)	(1331)	(1332)	(1333)	(1334)	(1335)	(1336)	(1337)	(1338)	(1339)	(1340)	(1341)	(1342)	(1343)	(1344)	(1345)	(1346)	(1347)	(1348)	(1349)	(1350)	(1351)	(1352)	(1353)	(1354)	(1355)	(1356)	(1357)	(1358)	(1359)	(1360)	(1361)	(1362)	(1363)	(1364)	(1365)	(1366)	(1367)	(1368)	(1369)	(1370)	(1371)	(1372)	(1373)	(1374)	(1375)	(1376)	(1377)	(1378)	(1379)	(1380)	(1381)	(1382)	(1383)	(1384)	(1385)	(1386)	(1387)	(1388)	(1389)	(1390)	(1391)	(1392)	(1393)	(1394)	(1395)	(1396)	(1397)	(1398)	(1399)	(1400)	(1401)	(1402)	(1403)	(1404)	(1405)	(1406)	(1407)	(1408)	(1409)	(1410)	(1411)	(1412)	(1413)	(1414)	(1415)	(1416)	(1417)	(1418)	(1419)	(1420)	(1421)	(1422)	(1423)	(1424)	(1425)	(1426)	(1427)	(1428)	(1429)	(1430)	(1431)	(1432)	(1433)	(1434)	(1435)	(1436)	(1437)	(1438)	(1439)	(1440)	(1441)	(1442)	(1443)	(1444)	(1445)	(1446)	(1447)	(1448)	(1449)	(1450)	(1451)	(1452)	(1453)	(1454)	(1455)	(1456)	(1457)	(1458)	(1459)	(1460)	(1461)	(1462)	(1463)	(1464)	(1465)	(1466)	(1467)	(1468)	(1469)	(1470)	(1471)	(1472)	(1473)	(1474)	(1475)	(1476)	(1477)	(1478)	(1479)	(1480)	(1481)	(1482)	(1483)	(1484)	(1485)	(1486)	(1487)	(1488)	(1489)	(1490)	(1491)	(1492)	(1493)	(1494)	(1
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**FIGURE 6-72B**



ADAPS - Test Cell Phase Summary					Defective Part		Description of Defective Part		Run No.	
Part Name	Number Tested	Part Name	Defective Part Serial Number	Reported Serial Number					Defective Part Number	Run No.
high time before overhaul	4								64	103
output roller bearing		204-040-40	2734	813-10041			pitted race		12	10
output ball bearing		204-040-424-1	21002	813-6480			rough		21	26
input roller bearing		204-040-40-1	15015	813-6480			pitted race			107
output roller bearing		204-040-40-1	22214	813-6329			damaged retainer		10	10
input roller bearing		204-040-40-1	1724	813-6329			N.A.			111
input ball bearing		204-040-43-1	35700	813-6329			rough			111
output ball bearing		204-040-424-1	3449	813-6329			rough			111
no rejections		N.A.	N.A.	813-9443					10	9
										115

FIGURE 6-72C

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199	199
234	234
238	238
241	241
246	246
310	310
314	314

FIGURE 0-72E

ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED

6, 7, 19, 20, 31-35, 40, 44, 50, 53, 77-80, 83, 84, 87-92, 93-102, 126, 127, 132, 133, 134, 144, 145, 147, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201-210, 270-281, 293, 301, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64
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**FIGURE 6-72F**

$\frac{dC}{C}$	$\frac{dC}{C}$	$\frac{dC}{C}$	Run No.
3-7, 18, 19, 20, 27, 30-35, 37, 40, 44, 45, 52, 53, 57-59, 70, 79, 81-83, 127, 139, 144, 156, 157, 161-163, 170-173, 174-175, 193, 214, 239, 240, 300-310, 312, 313, 324, 327, 330-340, 342	66	9, 30, 41-43, 62, 63, 66, 67, 83, 93, 103, 104, 111, 124, 125, 127, 128, 144-145, 149, 173, 185, 187, 197, 204-205, 212-214, 227, 233, 239-241, 243-245, 252, 253, 305-310, 312, 324, 325, 333, 339, 340	403
20, 34, 35, 44, 52, 56, 57, 60, 92, 115, 125, 127, 137, 138, 146, 147, 148-149, 154, 156, 157, 161-163, 170-173, 174-175, 193, 214, 239, 240, 300-310, 312, 313, 324, 327, 330-340, 342	37	..	431
3, 6, 23, 24, 34, 35, 44, 52, 56, 57, 60, 92, 115, 125, 127, 137, 138, 146, 147, 148-149, 154, 156, 157, 161-163, 170-173, 174-175, 193, 214, 239, 240, 300-310, 312, 313, 324, 327, 330-340, 342	59	2, 43, 49, 91, 92, 103, 124-127, 163, 170-172, 197, 203, 204, 210, 226, 239, 240, 243, 245, 252, 253, 305-310, 312, 324, 325, 333, 339-342	433
2, 23, 24, 34, 35, 44, 52, 56, 57, 60, 92, 115, 125, 127, 137, 138, 146, 147, 148-149, 154, 156, 157, 161-163, 170-173, 174-175, 193, 214, 239, 240, 300-310, 312, 313, 324, 327, 330-340, 342	44	9, 43, 49, 91, 92, 103, 124-127, 163, 170-172, 197, 203, 204, 210, 226, 239, 240, 243, 245, 252, 253, 305-310, 312, 324, 325, 333, 339-342	439
3, 6, 23, 24, 34, 35, 44, 52, 56, 57, 60, 92, 115, 125, 127, 137, 138, 146, 147, 148-149, 154, 156, 157, 161-163, 170-173, 174-175, 193, 214, 239, 240, 300-310, 312, 313, 324, 327, 330-340, 342	40	43, 92, 103, 104, 111, 115, 126, 127, 133, 172, 173, 211, 212, 241, 309-311, 333, 334	443
19-23, 30-32, 39, 52, 53, 54-59, 70, 71, 80, 81, 127, 135, 139, 147, 148, 157, 161, 162, 164, 169-174, 184, 185, 193, 199, 203-209, 216, 219, 220, 300-312, 333-335, 339-342	57	9, 87, 92, 93, 102-104, 124, 127, 160, 172, 173, 185, 191, 196, 203, 204, 207, 208, 211-213, 239, 240, 311, 312, 333-336	471
1, 35, 47, 52, 53, 54-59, 60, 70, 71, 80, 81, 82, 93, 104, 116, 117, 127, 135, 139, 147, 148, 157, 161, 162, 164, 169-174, 184, 185, 193, 199, 203-209, 216, 219, 220, 300-312, 333-335, 339-342	56	9, 43, 47, 50, 59, 92, 93, 103, 104, 114, 115, 116, 127, 133, 172, 173, 212, 241, 309-311, 333, 334	473
1, 35, 47, 52, 53, 54-59, 60, 70, 71, 80, 81, 82, 93, 104, 116, 117, 127, 135, 139, 147, 148, 157, 161, 162, 164, 169-174, 184, 185, 193, 199, 203-209, 216, 219, 220, 300-312, 333-335, 339-342	65	43, 50, 60, 67, 87, 92, 93, 104, 111, 125, 127, 133, 172, 173, 212, 241, 309-311, 333, 334	479

FIGURE C-72G



TOZVNT'WNOE1VOT'81MJO' W'2M'

THE FOLLOWING SPECTRA ARE COMPARED AGAINST THE NEAR SPECTRUM

**FIGURE 6-73 FOUR STANDARD DEVIATION COMPARISON SUMMARY  
GOOD FLIGHT DATA AGAINST TEST CELL MEAN**

THE FOLLOWING SPECTRA ARE COMPARED AGAINST THE MEAN SPECTRUM

**FIGURE 6-74 FOUR STANDARD DEVIATION COMPARISON SUMMARY  
GOOD FLIGHT DATA AGAINST TEST CELL MEAN**



THE FOLLOWING SPECTRA ARE COMPARED AGAINST THE NEAN SPECTRUM

ITEM# 42	GEARBOX	UNITS= GPK	PARAMETER TITLE= GEARMESH
PARAMETER NO. 61			
ITEM SPEED= 4203.20 RPM	TRANSMISSION INPUT SPEED=		
FREQUENCY RANGE= 5000 HZ	ANALYSIS BW= 21.973 HZ		

ITEM SPEED= 4203.20 RPM  
FREQUENCY RANGE= 5800 HZ  
TRANSMISSION INPUT SPEED= 6600 RPM  
ANALYSIS BY= 21.973 HZ  
TORQUE= 2810 IN.LB  
NO. OF SPEC. AVOID= 10  
NO. OF SPEC. COMPARED= 3

**FIGURE 6-75 FOUR STANDARD DEVIATION COMPARISON SUMMARY  
GOOD FLIGHT DATA AGAINST TEST CELL MEAN**

THE FOLLOWING SPECTRA ARE COMPARED AGAINST THE MEAN SPECTRUM

NUMBER OF FREQUENCY POINTS WHERE COMPARISON LEVEL IS EXCEEDED:

TYPE	RUN	ON	SPECTRUM	NO.	ITEM	SERIAL	NO.	M	MOS	MOS2	MOS3	MOS4
021049	5	205			6510	2160						
GREATER	MAN	M45			4	3	4	5	7	8	9	10
GREATER	MAN	M45			24	25	26	27	28	29	30	31
GREATER	MAN	M45			56	57	58	59	60	61	62	63
GREATER	MAN	M45			80	81	82	83	84	85	86	87
GREATER	MAN	M45			102	103	104	105	106	107	108	109
GREATER	MAN	M45			124	125	126	127	128	129	130	131
GREATER	MAN	M45			146	147	148	149	150	151	152	153
GREATER	MAN	M45			175	176	177	178	179	180	181	182
GREATER	MAN	M45			200	201	202	203	204	205	206	207
GREATER	MAN	M45			222	223	224	225	226	227	228	229
GREATER	MAN	M45			244	245	246	247	248	249	250	251
GREATER	MAN	M45			266	267	268	269	270	271	272	273
GREATER	MAN	M45			288	289	290	291	292	293	294	295
GREATER	MAN	M45			310	311	312	313	314	315	316	317
03459	11	205			6447	2137						
GREATER	MAN	M45			2	3	4	5	7	8	9	10
GREATER	MAN	M45			25	26	27	28	29	30	31	32
GREATER	MAN	M45			55	56	57	58	59	60	61	62
GREATER	MAN	M45			78	79	80	81	82	83	84	85
GREATER	MAN	M45			115	116	117	118	119	120	121	122
GREATER	MAN	M45			146	147	148	149	150	151	152	153
GREATER	MAN	M45			175	176	177	178	179	180	181	182
GREATER	MAN	M45			200	201	202	203	204	205	206	207
GREATER	MAN	M45			222	223	224	225	226	227	228	229
GREATER	MAN	M45			244	245	246	247	248	249	250	251
GREATER	MAN	M45			266	267	268	269	270	271	272	273
GREATER	MAN	M45			288	289	290	291	292	293	294	295
GREATER	MAN	M45			310	311	312	313	314	315	316	317
03459	52	205			9541	2141						
GREATER	MAN	M45			2	3	4	5	7	8	9	10
GREATER	MAN	M45			24	25	26	27	28	29	30	31
GREATER	MAN	M45			57	58	59	60	61	62	63	64
GREATER	MAN	M45			80	81	82	83	84	85	86	87
GREATER	MAN	M45			102	103	104	105	106	107	108	109
GREATER	MAN	M45			124	125	126	127	128	129	130	131
GREATER	MAN	M45			146	147	148	149	150	151	152	153
GREATER	MAN	M45			175	176	177	178	179	180	181	182
GREATER	MAN	M45			200	201	202	203	204	205	206	207
GREATER	MAN	M45			222	223	224	225	226	227	228	229
GREATER	MAN	M45			244	245	246	247	248	249	250	251
GREATER	MAN	M45			266	267	268	269	270	271	272	273
GREATER	MAN	M45			288	289	290	291	292	293	294	295
GREATER	MAN	M45			310	311	312	313	314	315	316	317

ITEM#	90 DEGREE GEARBOX	UNITS= IN/SEC,PK	NO. OF SPEC. ANALYD.= 11
PARAMETER NO. 69	OUTPUT QUILL BEARINGS		
ITEM SPEED= 1500.00 RPM	TRANSMISSION INPUT SPEED= 6600 RPM	TORQUE= 2210 IN.LB	NO. OF SPEC. COMPARED= 3
FREQUENCY RANGE= 2000 HZ	ANALYSIS BW= 0.789 HZ		

FIGURE 6-76 FOUR STANDARD DEVIATION COMPARISON SUMMARY  
GOOD FLIGHT DATA AGAINST TEST CELL MEAN

MSD/AIDAPS COMPARISON SUMMARY ANALYSIS

MEAN IDENTIFICATIONS MN2102 - 23

THE FOLLOWING SPECTRA ARE COMPARED AGAINST THE MEAN SPECTRUM

TYPE	RUN	CHANNEL	SPECTRUM NO.	ITEM SERIAL NO.	NUMBER OF FREQUENCY POINTS WHERE COMPARISON LEVEL IS EXCEEDED		
					M-5	M-35	M-45
02212	63	1	121	813-6623	46	1	0
02212	67	1	121	813-2925	115	24	0
02212	71	1	132	813-2925	91	13	0
02212	75	1	132	813-6604	246	14	0
02212	79	1	132	813-5195	69	117	0
02212	119	1	142	AB8-289	54	0	0
02212	119	1	442	813-7022	82	30	0
02212	203	1	1003	813-0603	79	0	0
02546	545	1	1634	813-8572	96	24	0
02546	549	1	1640	813-2950	71	10	0
02546	553	1	1642	813-4023	68	11	0
02546	557	1	1652	813-8554	116	37	0

ITEM 42 DEGREE GEARBOX PARAMETER NO. 59	UNITS IN/SEC PK PARAMETER TITLE	INPUT GULL AND OUTPUT GULL BEARINGS	NO. OF SPEC. AVGD. 11
ITEM SPEED 172.80 RPM FREQUENCY RANGE 2000 HZ	TRANSMISSION INPUT SPEED 6400 RPM ANALYSIS BY 2.789 42	TORQUE 3640 INLB	NO. OF SPEC. COMPARED 11

ALL RUNS ARE BASELINE

FIGURE 6-77

42 JUL 1966  
HSD/AIDAPS  
REF: 133  
100% = 11 ITEMS (GOOD)  
MAY 1972

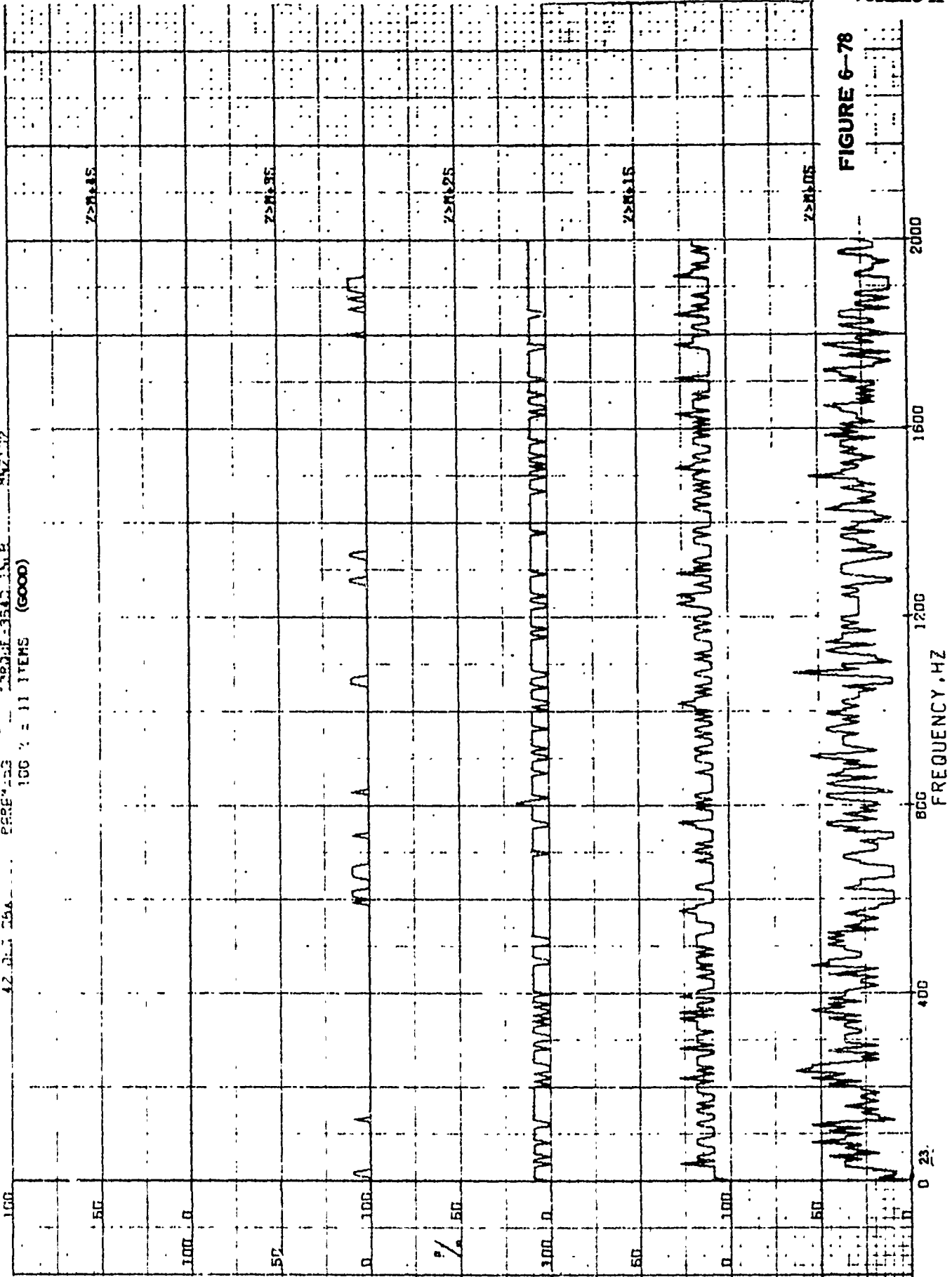


FIGURE 6-78

MSD/AIDAPS COMPARISON SUMMARY ANALYSIS

MEAN IDENTIFICATION: MN2102 -26

THE FOLLOWING SPECTRA ARE COMPARED AGAINST THE MEAN SPECTRUM

TAPE	RUN	CHANNEL	SPECTRUM NO.	ITEM	SERIAL NO.	M	NUMBER OF FREQUENCY POINTS WHERE COMPARISON LEVEL IS EXCEEDED
03276	274	1	1030	813-2925	70	M-25	M-25
BANDS GREATER THAN M-45		81, 130, 139, 147, 156, 161, 172, 173, 183, 196, 200, 205, 207, 208, 209, 209, 300, 310, 311, 312, 324, 330,					
BANDS GREATER THAN M-45							
03276	278	1	1044	AB8-209	59	M-25	M-25
BANDS GREATER THAN M-45		107, 108, 102, 173, 185, 196, 220, 260, 289, 300, 311, 312, 323, 324,					
BANDS GREATER THAN M-45							
03276	282	1	1051	813-0304	104	M-25	M-25
BANDS GREATER THAN M-45		65, 66, 81, 85, 87, 92, 107, 109, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 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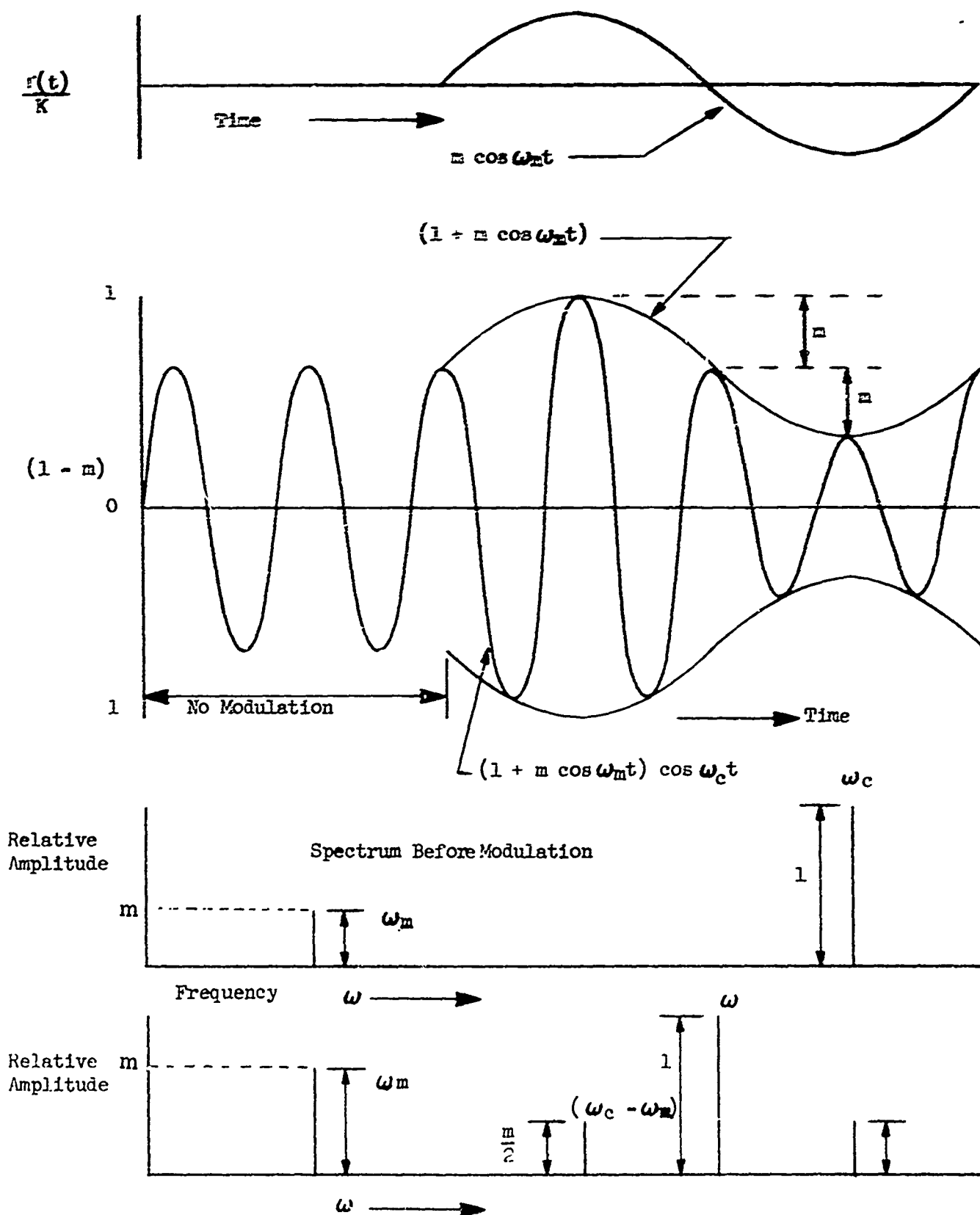
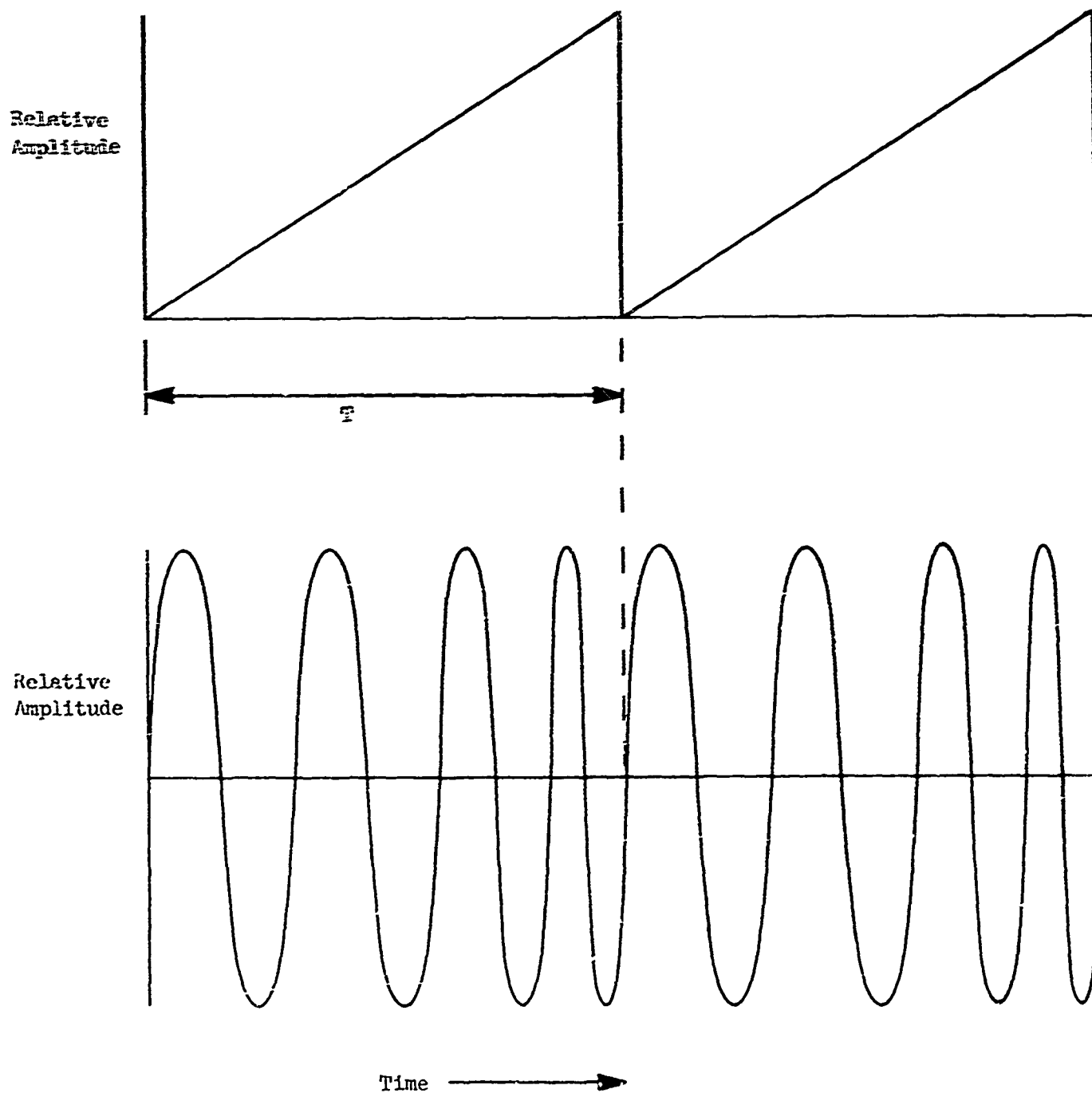
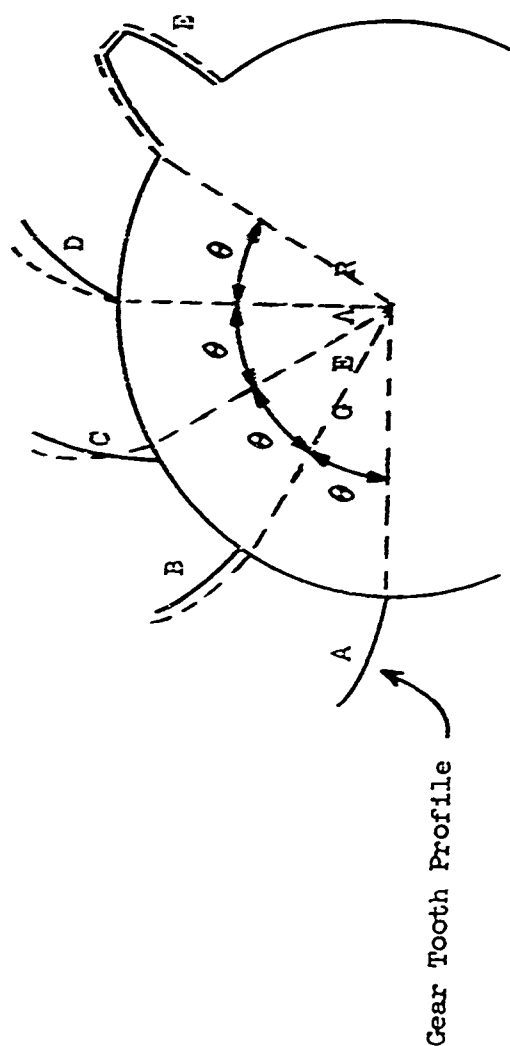


FIGURE 6-81 AMPLITUDE MODULATION AND SPECTRUM

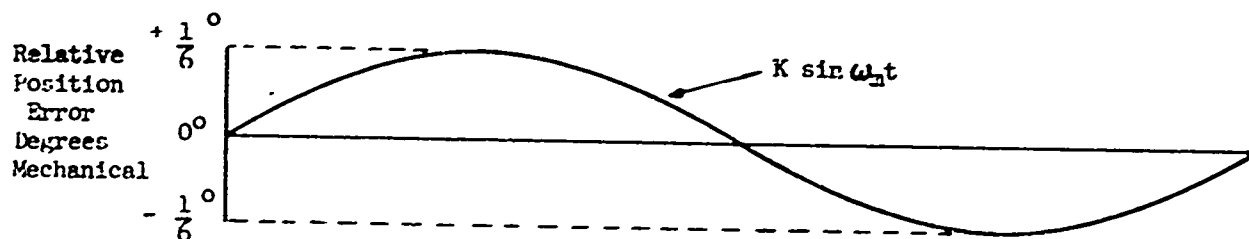
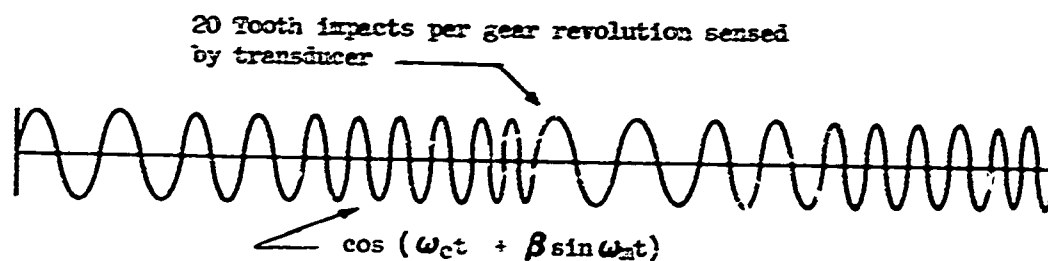
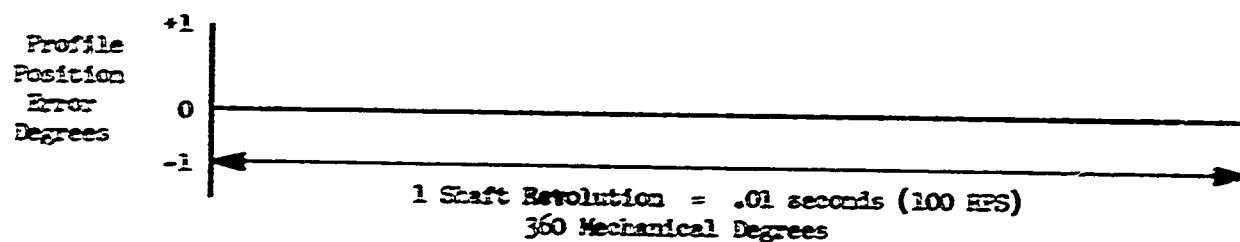
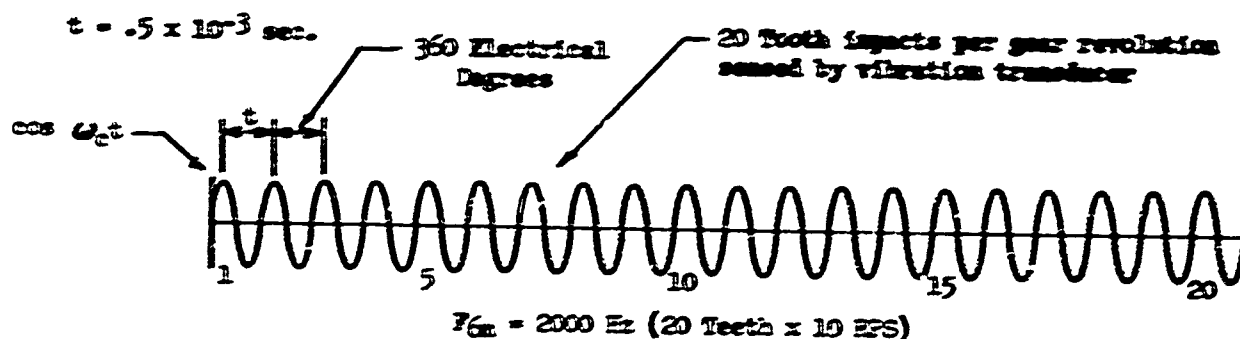






1. The broken line profiles represent theoretically perfect profile positions.  
The solid lines represent typical inaccuracies resulting from gear manufacture.
2. Only one profile is drawn for each error example except for the tooth thickness variation example E.
3. Profile error examples:
  - A. Reference profile perfect form and position.
  - B. Profile spacing variation.
  - C. Profile deviation from true involute curve.
  - D. Profile radial position variation due to runout.
  - E. Tooth thickness deviation.

FIGURE 6-83 GEAR TOOTH PROFILE POSITION ERRORS



$$360 \text{ Electrical Degrees} = \frac{360}{20} = 18 \text{ Mechanical Degrees}$$

$$\frac{1}{6}^\circ \text{ Mechanical error in profile position} = 3.3 \text{ Electrical Degrees}$$

$$3.6^\circ \text{ Electrical Degrees}$$

$$\frac{3.6}{360} \times 100 = 1\% \text{ or effective instantaneous peak carrier frequency change of 20 hertz}$$

$$\beta = \frac{\Delta f}{f_m} = \frac{20}{100} \approx .2$$

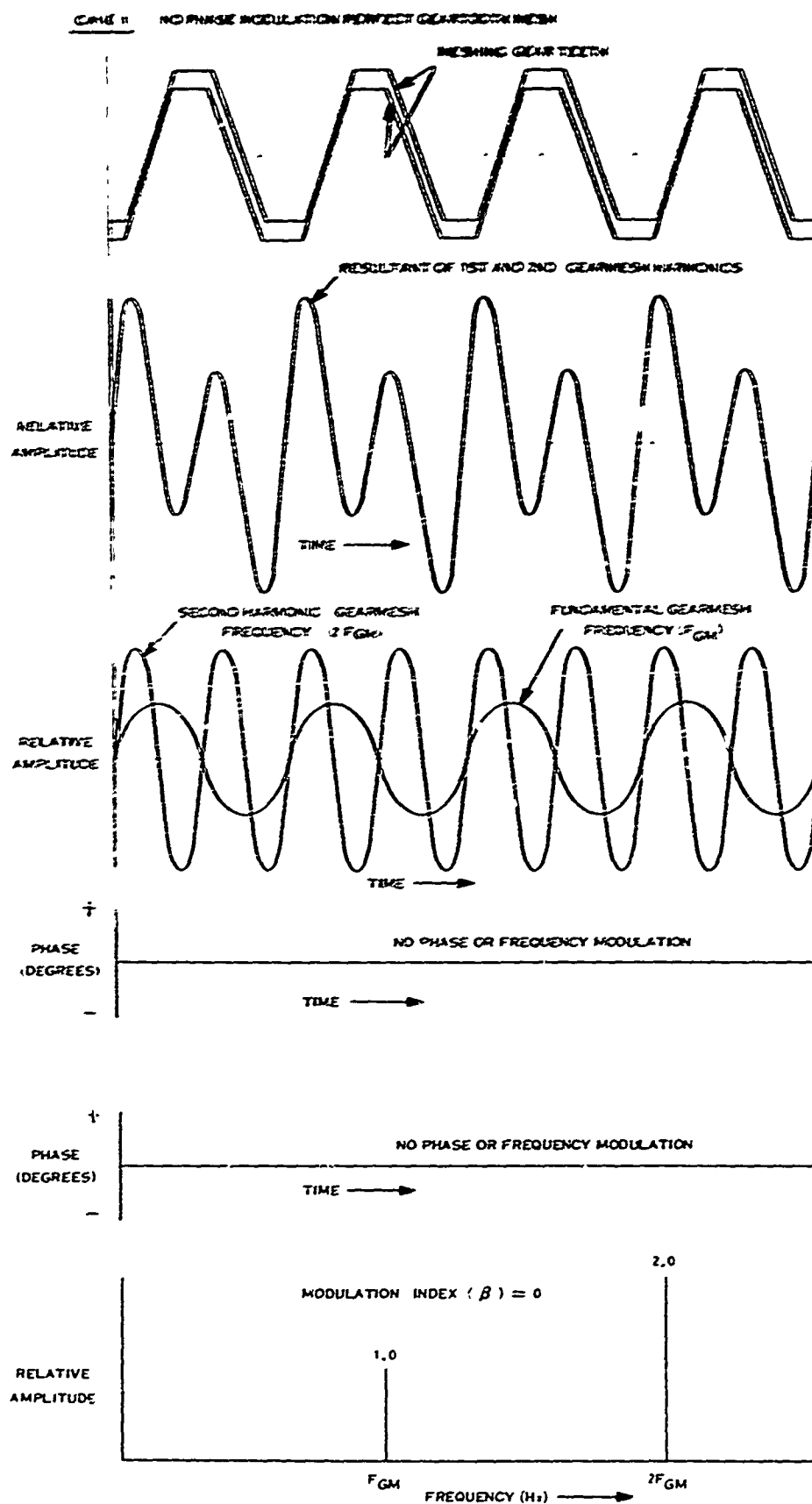
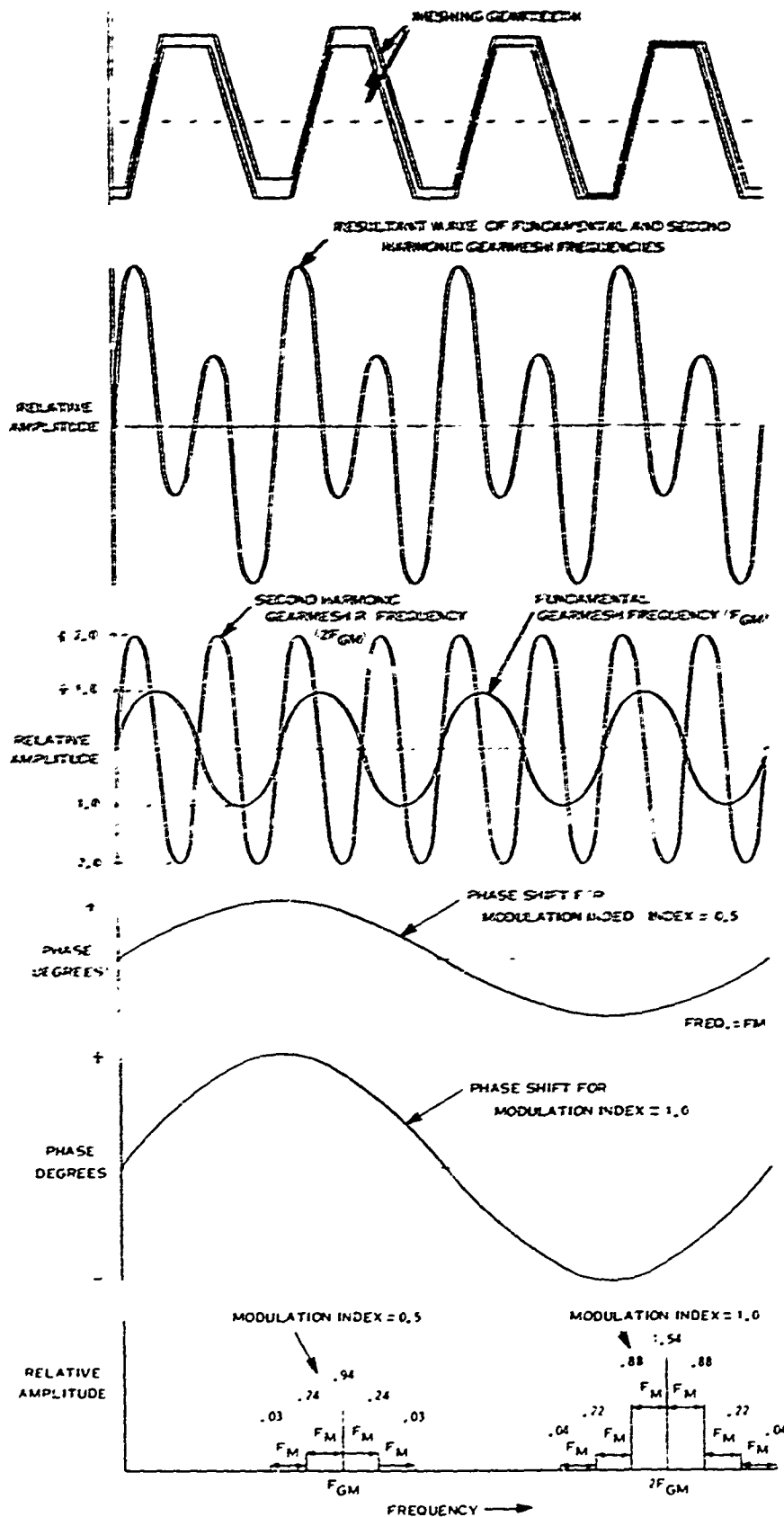


FIGURE 6-85

CASE 2 MODERATE AMOUNT OF FREQUENCY MODULATION



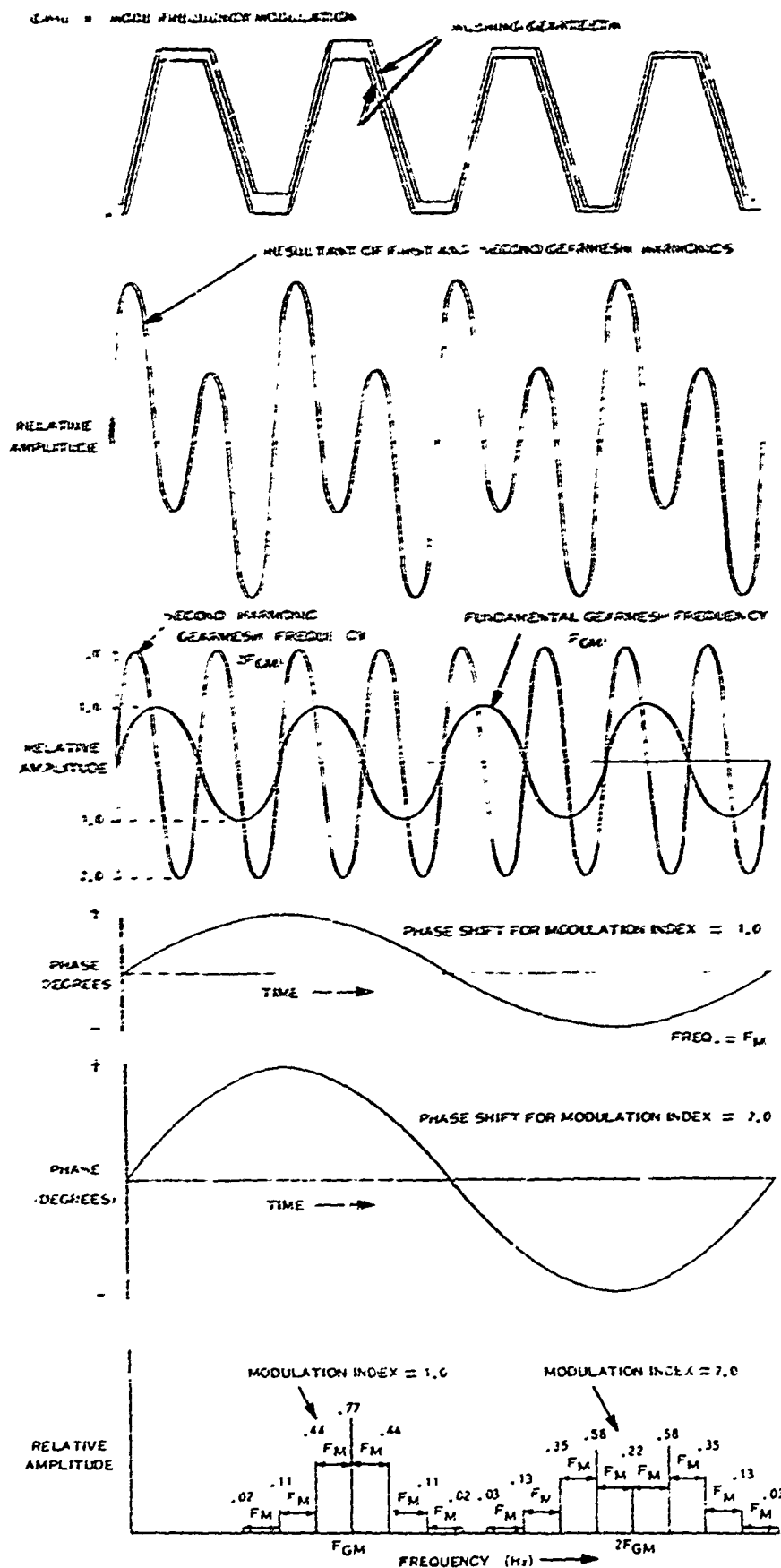
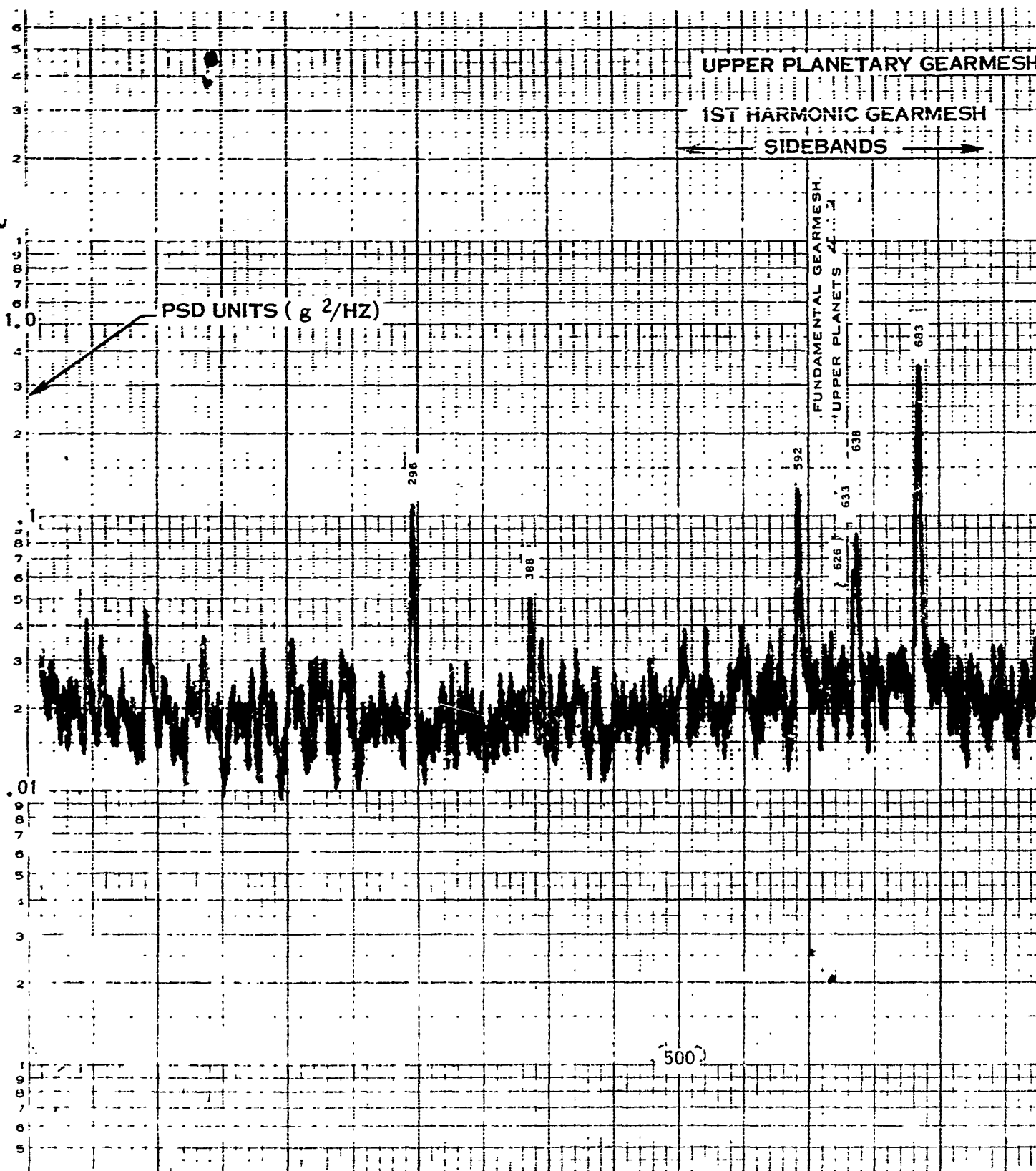


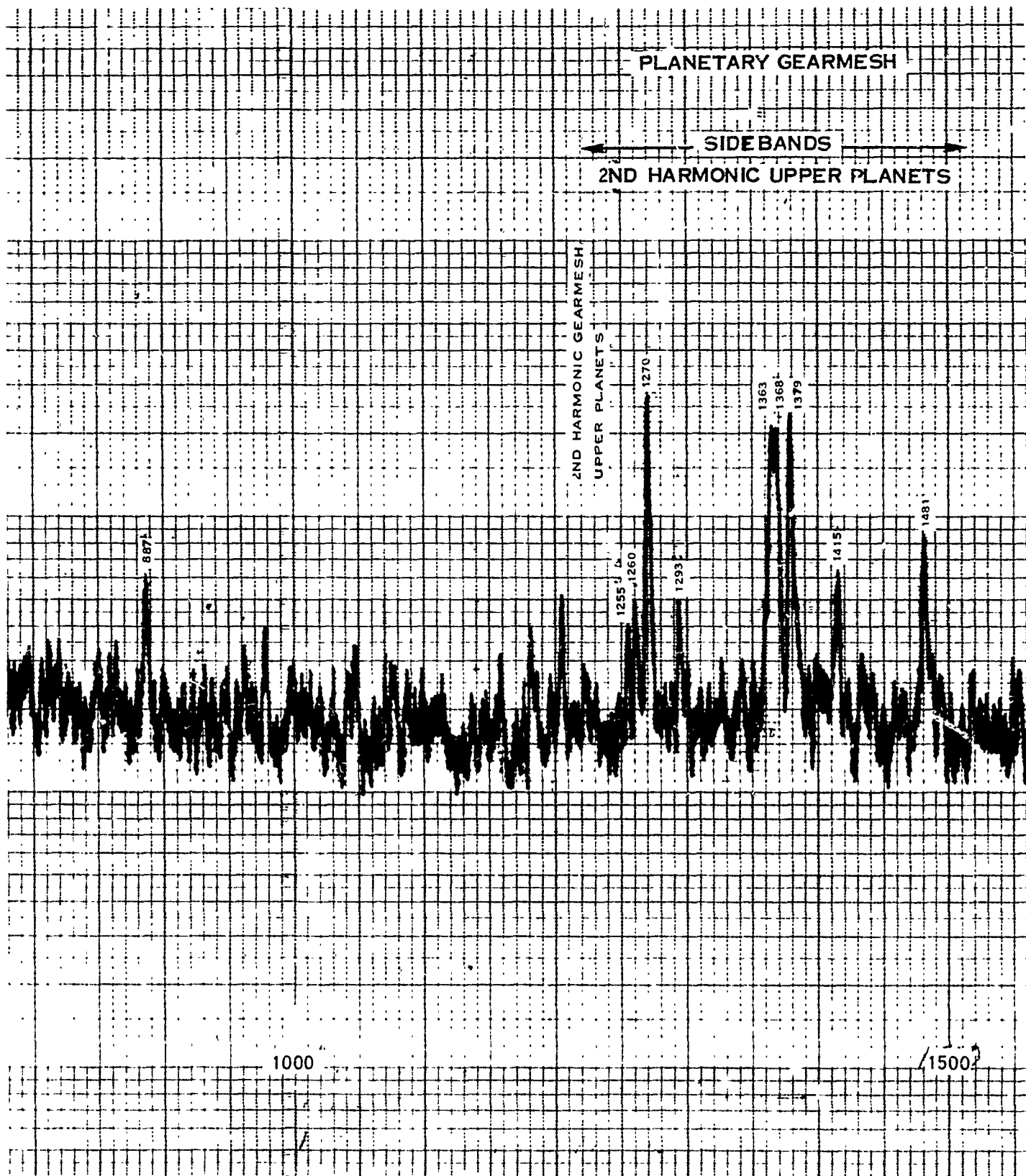
FIGURE 6-87

TABLE OF MODULATION INDICES ( $\beta$ ) FOR VARIOUS POWER TRAIN GEARWESES

GEARWESE	FREQ. $f_m$	$f$	$\beta_1$	$\beta_2$	$\beta_3$	$\beta_4$	$\beta_5$	$\beta_6$	$\beta_7$
90° Output	1076	28	10.7	.38	.76	--	--	--	--
90° Input	1076	72	10.7	.15	.30	--	--	--	--
42° Transmission	1936	72	19.4	.27	.54	--	--	--	--
Input Quill Bevel	3190	110	31.9	.29	--	--	--	--	--
Input Quill Pinion	3190	52	31.9	.61	--	--	--	--	--
Accessory Drive Bevel	2827	51	28.3	.55	--	--	--	--	--
Accessory Drive Pinion	2827	69	28.3	.41	--	--	--	--	--
Tail Rotor Bevel	1870	69	18.7	.27	.54	--	--	--	--
Tail Rotor Pinion	1870	72	18.7	.26	.52	--	--	--	--
Lower Sun	1980	51	19.8	.39	.78	--	--	--	--
Lower Planets	1980	17	19.8	1.16	2.32	--	--	--	--
Upper Sun	641	17	6.4	.38	.76	1.14	1.52	1.9	2.28
Upper Planets	641	5	6.4	1.28	2.56	3.84	5.12	6.4	7.68
Lower Case Ring Gear	1980	17	19.8	1.16	2.32	--	--	--	--
Upper Case Ring Gear	641	5	6.4	1.28	2.56	3.84	5.12	6.4	7.68

FIGURE 6-88

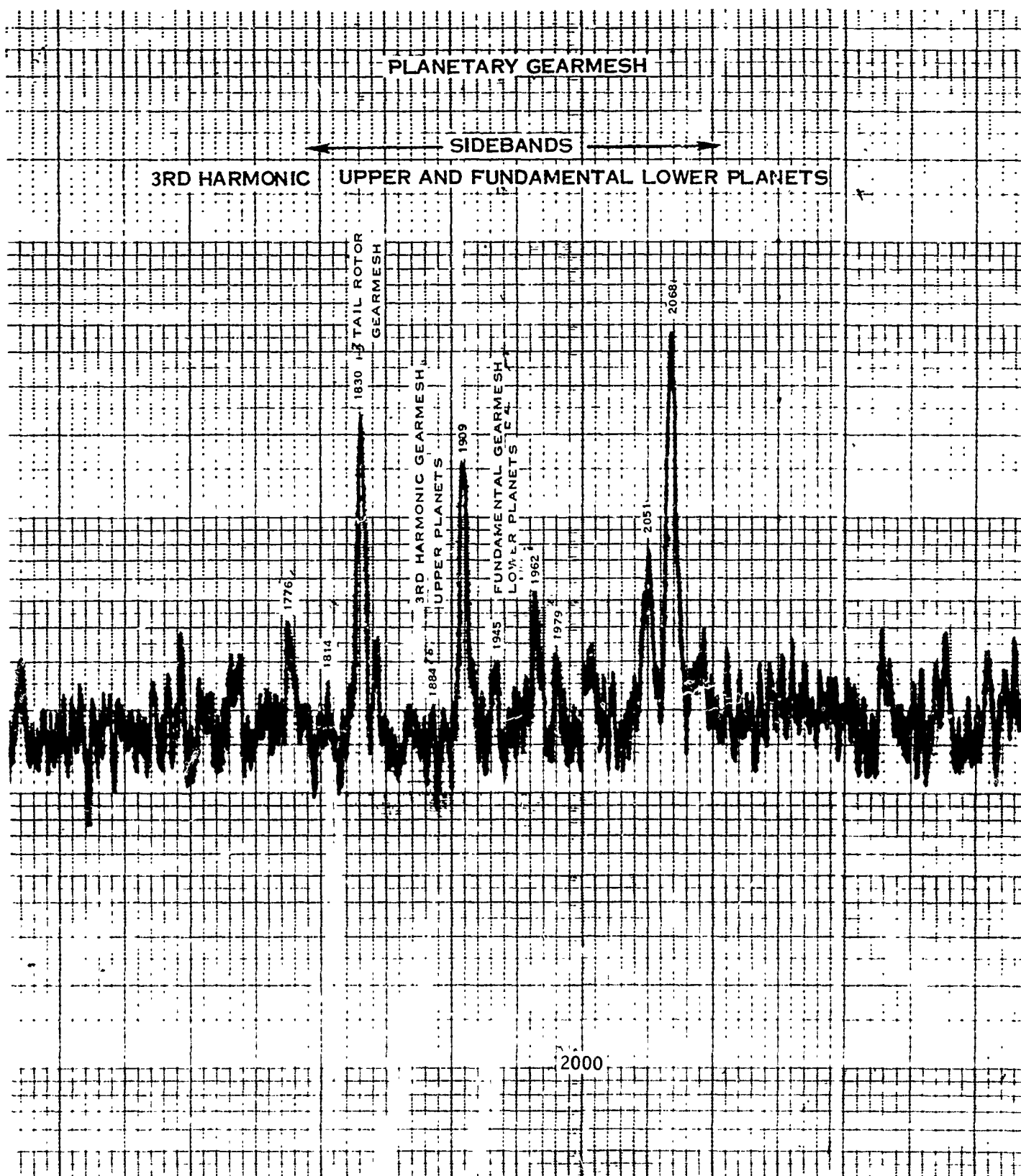


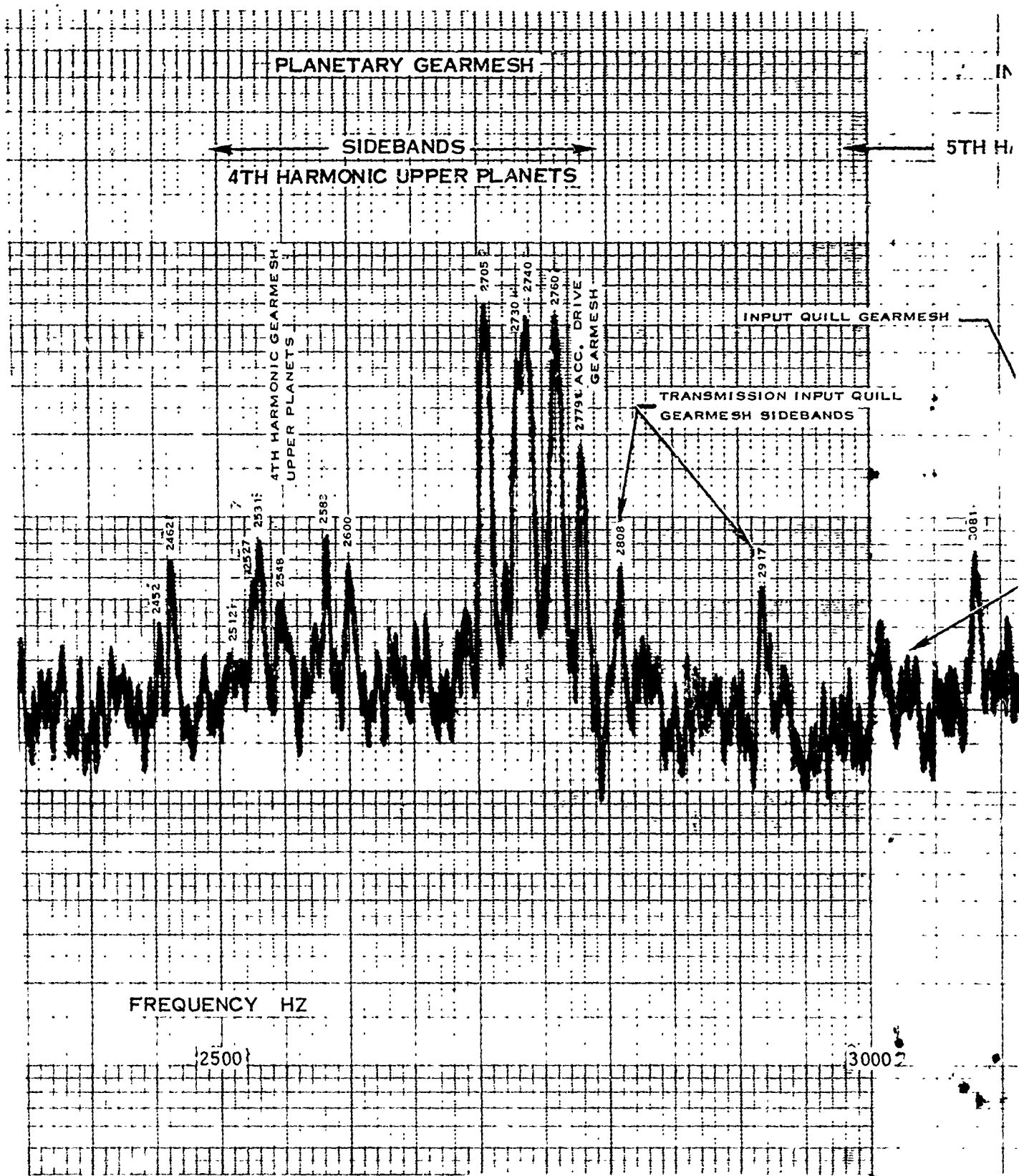


257

89 13







259

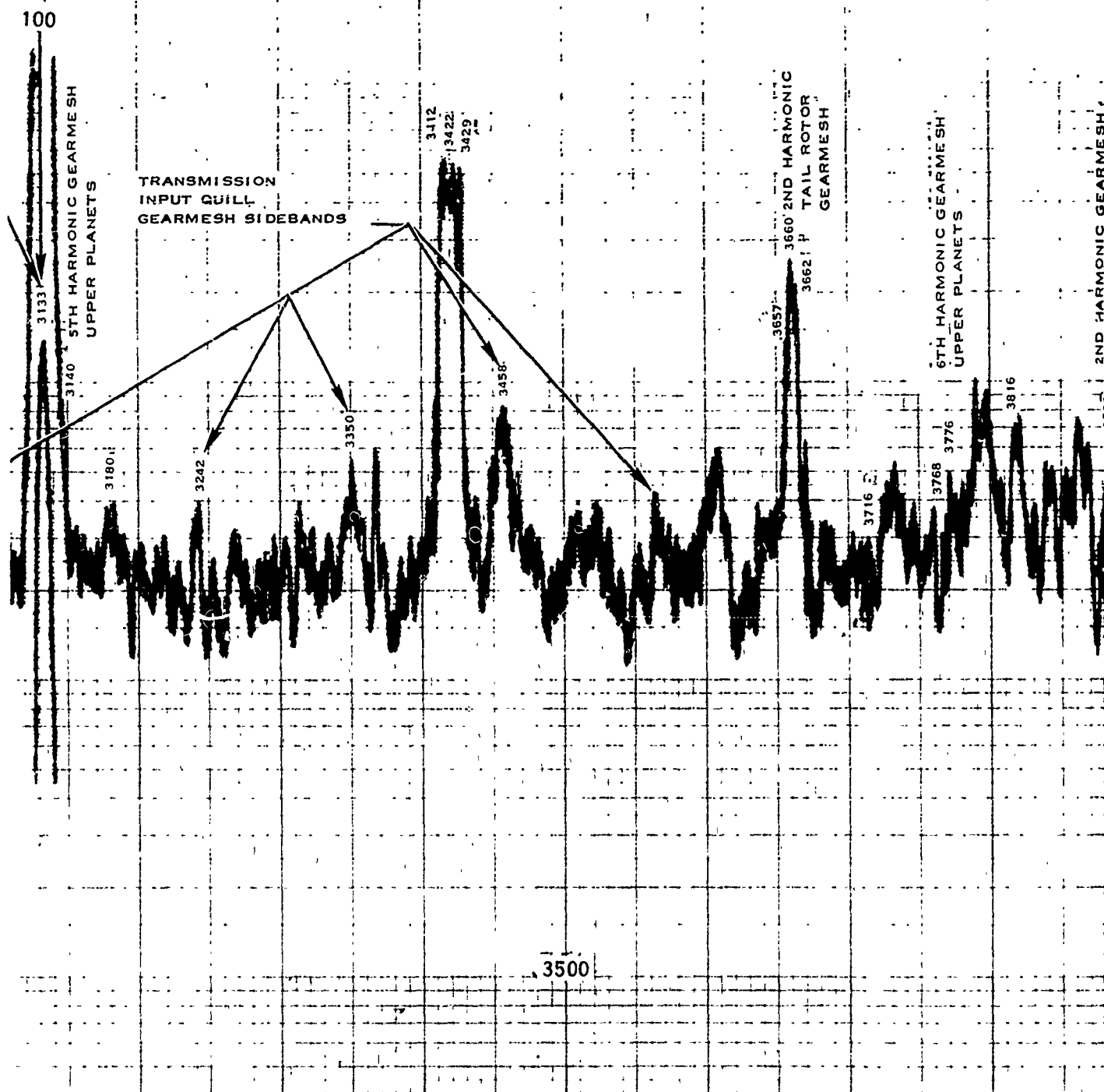
89D

INPUT QUILL GEARMESH AND SIDEBANDS

6TH HARMONIC UPPER  
PI

HARMONIC UPPER PLANETS AND SIDEBANDS →

← SI



AND 2ND HARMONIC LOWER  
PLANETARY

7TH HARMONIC UPPER PLANETARY

DEBANDS →

← SIDEBANDS

100

LOWER PLANETS

7TH HARMONIC GEARMESH  
UPPER PLANETS

4000

261

89 F

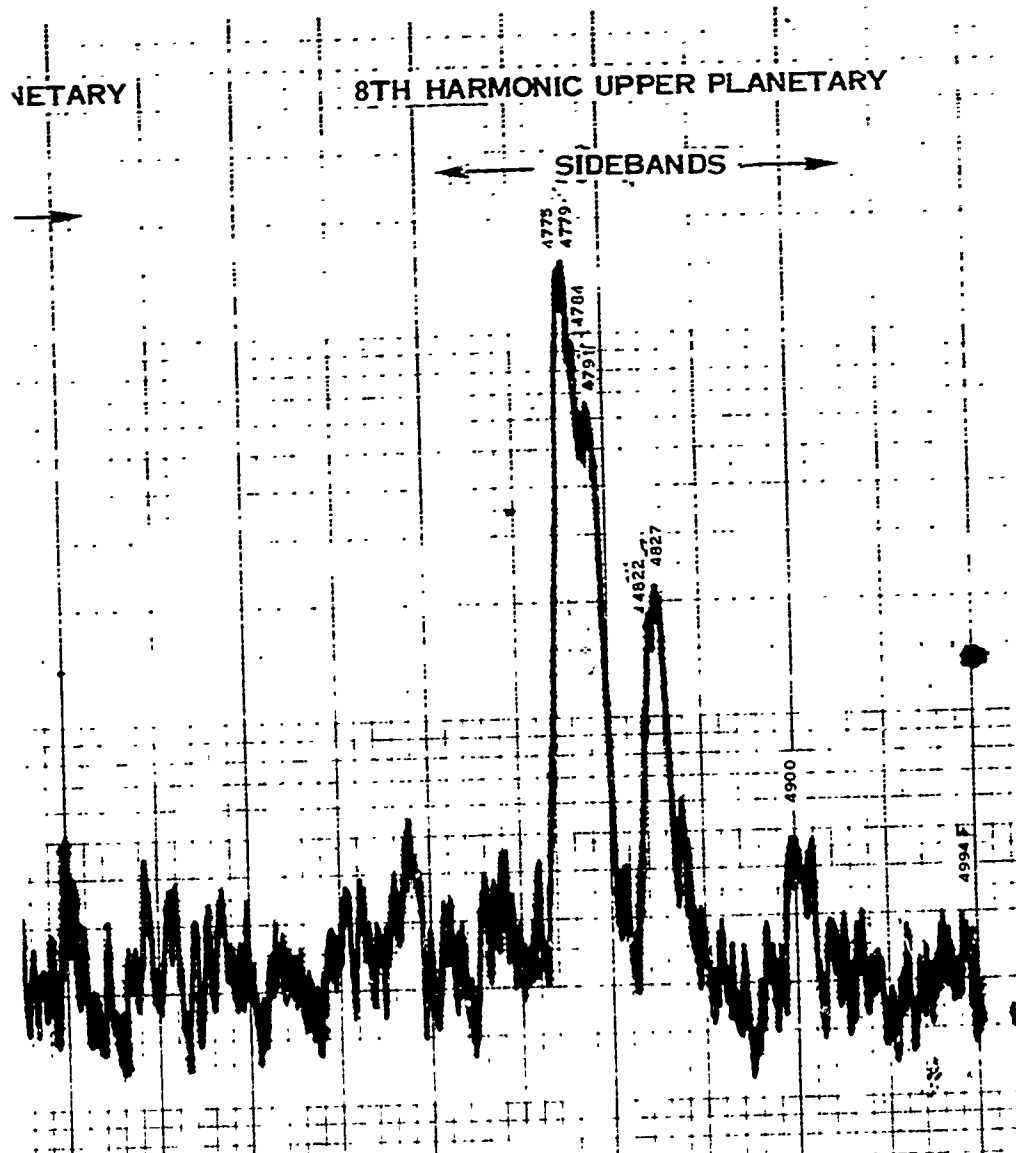


FIGURE 6-89

FLIGHT TEST RUN NO. 93  
REEL NO. 031227  
TRANSDUCER NO. 125  
TRANSMISSION INPUT QUILL  
DEFECTIVE INPUT QUILL BEARINGS  
ANALYSIS BANDWIDTH 2.5 HZ

4500

5000

263

Band No.	Freq. (Hz)	TRANSMISSION				ALL MEASUREMENT ARE IN IN			
		H.P. #129 IPS	Rot. #129 c/s	TA #129 c/s	TA #129 IPS	TA #129 IPS	TA #129 IPS	TA #129 IPS	TA #129 IPS
8	102	-	.74	-	-	.15	.07	.07	.07
16	213	-	.18	-	.021	.034	.015	.015	.015
19	263	-	.50	-	.015	.335	.022	.022	.022
26	366	-	.13	-	-	.022	.017	.017	.017
31	439	-	.29	-	-	.051	.027	.027	.027
36	512	.05	.66	.24	.04	.022	.019	.019	.019
39	556	.021	.63	.27	.05	.044	.01	.01	.01
45	645	.071	1.51	.67	.66	.143	3.32	.153	.153
50	718	-	.74	-	-	.054	.086	.086	.086
53	761	.0097	.46	.13	.015	.03	.033	.033	.033
57	820	.016	.33	.15	.011	.044	.017	.017	.017
61	879	.027	1.23	.24	.01	.032	.015	.015	.015
64	922	.015	.41	.14	.012	.019	.015	.015	.015
70	1010	.018	.62	.20	.012	.048	.01	.01	.01
72	1040	-	.62	-	-	-	-	-	-
76	1098	.078	3.05	.96	.021	.22	.022	.022	.022
85	1230	-	.84	1.82	.034	.052	.027	.027	.027
89	1269	.143	1.04	3.4	.065	.055	.057	.057	.057
95	1376	-	1.5	-	-	.087	.007	.007	.007
92	1333	.098	.78	.72	.018	.039	.012	.012	.012
99	1435	-	.57	.74	.018	.020	.009	.009	.009
106	1538	-	-	.40	.015	.033	.008	.008	.008
110	1596	.031	.96	.31	.031	.045	.057	.057	.057
114	1655	.031	1.45	.52	.029	.03	.01	.01	.01
104	1508	-	-	-	-	.05	.007	.007	.007
119	1728	.018	1.13	.36	.01	.032	.004	.004	.004
124	1801	.029	1.8	.46	.016	.038	.01	.01	.01
129	1875	.102	12.3	2.40	.082	.364	.031	.031	.031
133	1933	.031	2.7	2.70	.062	.072	.073	.073	.073
138	2006	.031	1.7	2.10	.27	.04	.37	.37	.37
143	2080	-	1.34	-	-	.013	.022	.022	.022
147	2138	.017	1.8	.60	.025	.019	.016	.016	.016
151	2197	.011	.81	.65	.027	.018	.01	.01	.01
158	2299	.009	.87	.55	.017	.01	.01	.01	.01
161	2343	.0087	-	.65	.01	.01	.01	.01	.01
162	2358	-	1.02	-	-	-	-	-	-

MEAN VIBRATION VALUES FOR TRANSMISSION AND GEARBOXES FLIGHT TEST (PHASE D)

FIGURE 6-90A

STRAIGHT AND LOWER FLIGHT

90° gear mesh

90° gear mesh

TRANSMISSION										ALL RESONANCE ARE PEAK									
Band No.	Freq. (Hz)	H.P. #129 IFS	Tail Rotor #126 g's	IQ #125 g's	MT-RAD #123 IFS	Tail Rotor #129 IFS	WV Axial #177 IFS	IC #175 IFS		Band No. C-2012	Freq. Hz	WV #164 IFS	IC #160 IFS	42° DB #157 IFS					
165	2402	.011	.5	.60	.02	.014	.015	.023		194	1130	.057	.037	.035					
169	2450	.010	.51	.73	.021	.012	.01	.020		197	1145	.064	.054	.05					
177	2578	.02	.54	1.34	.053	.01	.0335	.069*		201	1171	.064	.054	.05					
184	2680	.015	.54	.84	.023	.01	.016	.036		203	1181	.012	.01	.012					
188	2739	.02	.54	.88	.023	.01	.016	.036		204	1189	.016	.01	.012					
189	2753	.028	.73	4.2	.045	.012	.049	.114	4th harmonic upper sun & planets	209	1215	.021	.017	.012					
191	2783	.02	.93	.77	.02	.01	.02	.025		220	1283	.02	.02	.014					
194	2827	.048	1.5	2.7	.038	.027	.022	.04*		221	1289	.02	.02	.017					
198	2885	.02	.7	.88	.022	.01	.015	.019	ACC. Drive gears	222	1294	.0036	.024	.015					
201	2929	.02	.7	.86	.015	.011	.014	.023		232	1353	.0115	.012	.02					
204	2973	.02	.71	1.7	.019	.014	.016	.032		234	1365	.011	.014	.041					
212	3090	.025	.77	1.6	.028	.01	.034	.054		235	1375	.0117	.025	.01					
215	3134	.029	.65	1.5	.045	.008	.039	.043		245	1429	.023	.034	.063					
219	3193	.13	1.0	22.8	.186	.066	.212	.594*	Input quill gearmesh & 5th harmonic upper planets	246	1435	.011	.025	.008					
223	3251	.02	.5	1.45	.06	.017	.05	.042		251	1464	.011	.025	.008					
226	3295	.03	.64	1.4	.045	.01	.03	.057		256	1494	.015	.042	.018					
209	3046	.02	.7	.77	.02	.008	.018	.041		262	1529	.015	.042	.018					
229	3339	.02	.54	.77	.02	.008	.018	.041		270	1576	.015	.042	.018					
234	3413	.026	.45	1.5	.02	.007	.02	.033		275	1605	.015	.042	.025					
237	3457	.032	.54	1.0	.017	.016	.017	.031		283	1652	.015	.042	.023					
246	3588	.019	.44	.73	.015	.014	.018	.023		295	1722	.013	.042	.019					
251	3662	.043	1.01	1.02	.018	.037	.025	.02	2nd harmonic tail rotor GM	298	1740	.015	.031	.011					
256	3735	.22	3.63	2.60	.033	.348	.044	.13*		306	1787	.044	.051	.020					
260	3793	.045	.9	1.3	.046	.067	.064	.049		307	1792	.044	.066	.044					
265	3867	.064	.58	3.6	.245	.026	.425	.022		311	1816	.0305	.036	.013					
269	3925	.075	.76	4.0	.24	.038	.573	.295*	6th harmonic upper sun & planets	316	1845	.017	.025	.012					
274	3999	.068	.57	7.3	.23	.052	.216	.214*	2nd harmonic lower sun & planets	319	1853	.012	.021	.013					
279	4072	.02	.46	6.8	.316	.037	.328	.196		321	1875	.014	.04	.014					
282	4116	.02	.54	.77	.076	.018	.068	.058		332	1939	.04	.05	.014					
290	4233	.021	.76	.70	.027	.027	.03	.031		331	1933	.09	.05	.017					
292	4262	.02	.73	.77	.041	.021	.028	.024		341	1992	.017	.05	.017					
297	4335	.02	.78	.77	.028	.027	.021	.025		279	1620	.017	.05	.017					
300	4380	.01	.92	.9	.05	.034	.022	.028											
305	4453	.014	.96	1.0	.023	.047	.019	.031	7th harmonic upper sun & planets										
310	4526	.014	.89	2.5	.059	.038	.041	.059*											
314	4585	.013	1.07	1.0	.024	.05	.0136	.028											

420 gear steel

FIGURE 6-90B

265

TRANSMISSION

Band No.	Freq. (Hz)	H.P. #129 IPS	Tail Rotor #129 C's	Wash #129 IPS	Tail Rotor #129 C's	Wash #129 IPS	Wash #129 IPS	Wash #129 IPS
317	4.25	.013	.4	.4	.4	.4	.4	.4
321	4.25	.013	.4	.4	.4	.4	.4	.4
324	4.31	.014	.4	.4	.4	.4	.4	.4
330	4.520	.014	.4	.4	.4	.4	.4	.4
334	4.52	.014	.4	.4	.4	.4	.4	.4
337	4.522	.014	.4	.4	.4	.4	.4	.4
339	4.51	.014	.4	.4	.4	.4	.4	.4

H.P. - Hydraulic Pump and Teckometer quill.  
Tail Rotor - Transmission Tail Rotor Shaft System.  
Input quill Shaft System  
MM Rad. - Main Mast Shaft System (Radial)  
MM Axial - Main Mast Shaft System (Axial).  
IQ - Input Quill  
OQ - Output Quill  
I + OQ - Input and Output Quill  
GM - Gearmesh

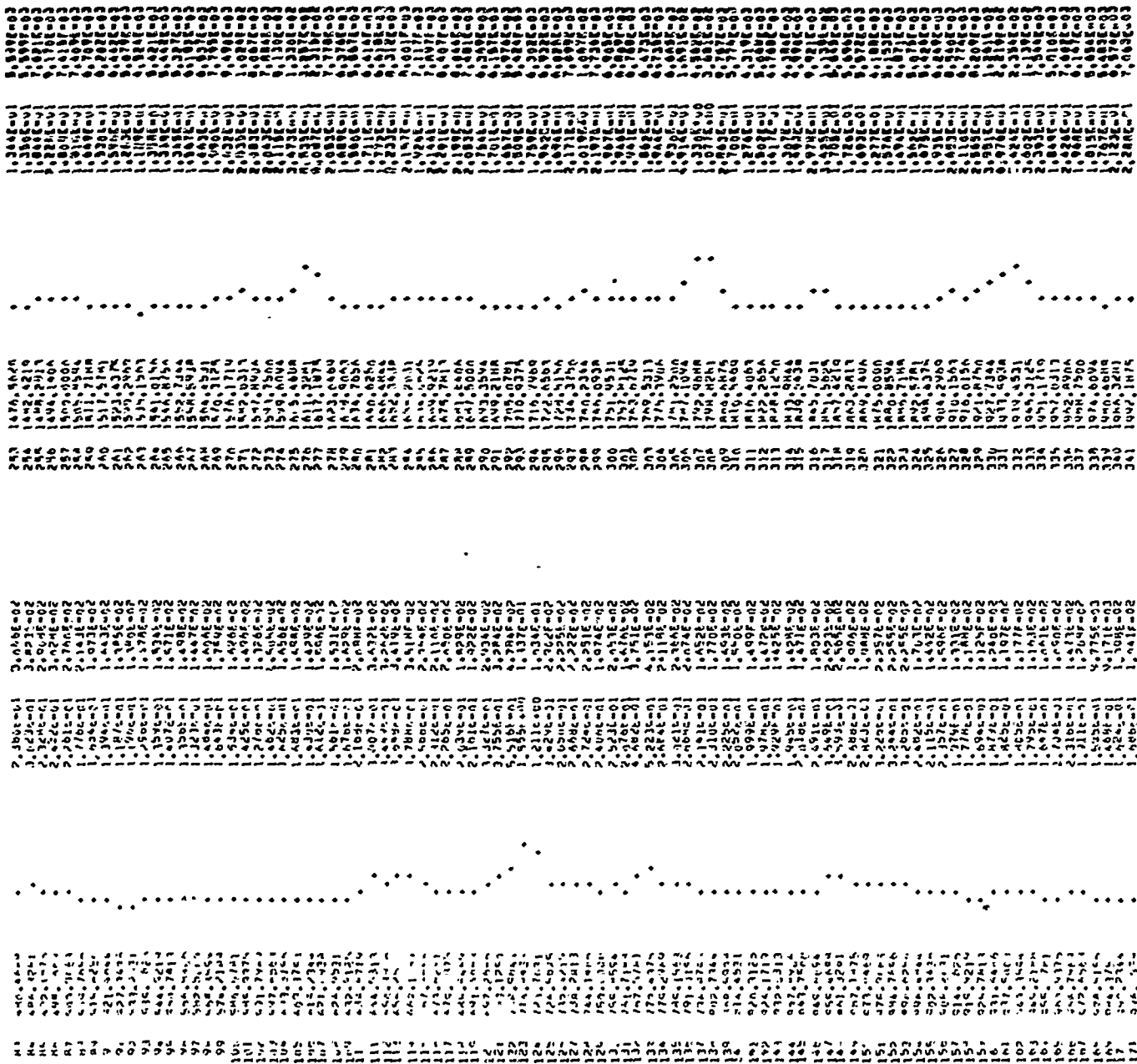
FIGURE 6-90C



Band # 0-15KHz	Freq. Hz	3M dB	Band # 0-15KHz	Freq. Hz	3M dB
2	14	1.092	24	3420	1.1
3	15	.829	25	3480	1.1
12	1.1	.0	26	3540	1.2
14	212	.33	27	3600	1.2
20	228	.31	28	3660	1.2
25	351	.1	29	3720	1.2
30	424	.095	30	3780	1.2
35	496	.111	31	3840	1.2
41	555	.235	32	3900	1.2
48	559	.206	33	3960	1.2
50	71	.9	34	4020	1.2
55	791	.25	35	4080	1.2
60	864	.27	36	4140	1.2
65	937	.34	37	4200	1.2
70	1010	.37	38	4260	1.2
75	1083	.86	39	4320	1.2
79	1142	.25	40	4380	1.2
84	1215	.54	41	4440	1.2
89	1289	.24	42	4500	1.2
94	1362	.20	43	4560	1.2
99	1435	.42	44	4620	1.2
104	1508	.211	45	4680	1.2
109	1582	.155	46	4740	1.2
114	1655	.3	47	4800	1.2
119	1728	.29	48	4860	1.2
124	1801	.88	49	4920	1.2
129	1875	.74	50	4980	1.2
133	1933	7.8	51	5040	1.2
138	2006	1.17	52	5100	1.2
143	2080	.77	53	5160	1.2
148	2153	1.32	54	5220	1.2
153	2226	.82	55	5280	1.2
157	2285	.83	56	5340	1.2
161	2343	.73	57	5400	1.2
167	2431	.64	58	5460	1.2
172	2494	.5	59	5520	1.2
			60	5580	1.2
			61	5640	1.2
			62	5700	1.2
			63	5760	1.2
			64	5820	1.2
			65	5880	1.2
			66	5940	1.2
			67	6000	1.2
			68	6060	1.2
			69	6120	1.2
			70	6180	1.2
			71	6240	1.2
			72	6300	1.2
			73	6360	1.2
			74	6420	1.2
			75	6480	1.2
			76	6540	1.2
			77	6600	1.2
			78	6660	1.2
			79	6720	1.2
			80	6780	1.2
			81	6840	1.2
			82	6900	1.2
			83	6960	1.2
			84	7020	1.2
			85	7080	1.2
			86	7140	1.2
			87	7200	1.2
			88	7260	1.2
			89	7320	1.2
			90	7380	1.2
			91	7440	1.2
			92	7500	1.2
			93	7560	1.2
			94	7620	1.2
			95	7680	1.2
			96	7740	1.2
			97	7800	1.2
			98	7860	1.2
			99	7920	1.2
			100	7980	1.2
			101	8040	1.2
			102	8100	1.2
			103	8160	1.2
			104	8220	1.2
			105	8280	1.2
			106	8340	1.2
			107	8400	1.2
			108	8460	1.2
			109	8520	1.2
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			126	9540	1.2
			127	9600	1.2
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			133	9960	1.2
			134	10020	1.2
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			136	10140	1.2
			137	10200	1.2
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			139	10320	1.2
			140	10380	1.2
			141	10440	1.2
			142	10500	1.2
			143	10560	1.2
			144	10620	1.2
			145	10680	1.2
			146	10740	1.2
			147	10800	1.2
			148	10860	1.2
			149	10920	1.2
			150	10980	1.2
			151	11040	1.2
			152	11100	1.2
			153	11160	1.2
			154	11220	1.2
			155	11280	1.2
			156	11340	1.2
			157	11400	1.2
			158	11460	1.2
			159	11520	1.2
			160	11580	1.2
			161	11640	1.2
			162	11700	1.2
			163	11760	1.2
			164	11820	1.2
			165	11880	1.2
			166	11940	1.2
			167	12000	1.2
			168	12060	1.2
			169	12120	1.2
			170	12180	1.2
			171	12240	1.2
			172	12300	1.2
			173	12360	1.2
			174	12420	1.2
			175	12480	1.2
			176	12540	1.2
			177	12600	1.2
			178	12660	1.2
			179	12720	1.2
			180	12780	1.2
			181	12840	1.2
			182	12900	1.2
			183	12960	1.2
			184	13020	1.2
			185	13080	1.2
			186	13140	1.2
			187	13200	1.2
			188	13260	1.2
			189	13320	1.2
			190	13380	1.2
			191	13440	1.2
			192	13500	1.2
			193	13560	1.2
			194	13620	1.2
			195	13680	1.2
			196	13740	1.2
			197	13800	1.2
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			218	15060	1.2
			219	15120	1.2
			220	15180	1.2
			221	15240	1.2
			222	15300	1.2
			223	15360	1.2
			224	15420	1.2
			225	15480	1.2
			226	15540	1.2
			227	15600	1.2
			228	15660	1.2
			229	15720	1.2
			230	15780	1.2
			231	15840	1.2
			232	15900	1.2
			233	15960	1.2
			234	16020	1.2
			235	16080	1.2
			236	16140	1.2
			237	16200	1.2
			238	16260	1.2
			239	16320	1.2
			240	16380	1.2
			241	16440	1.2
			242	16500	1.2
			243	16560	1.2
			244	16620	1.2
			245	16680	1.2
			246	16740	1.2
			247	16800	1.2
			248	16860	1.2
			249	16920	1.2
			250	16980	1.2
			251	17040	1.2
			252	17100	1.2
			253	17160	1.2
			254	17220	1.2
			255	17280	1.2
			256	17340	1.2
			257	17400	1.2
			258	17460	1.2
			259	17520	1.2
			260	17580	1.2
			261	17640	1.2
			262	17700	1.2
			263	17760	1.2
			264	17820	1.2
			265	17880	1.2
			266	17940	1.2
			267	18000	1.2
			268	18060	1.2
			269	18120	1.2
			270	18180	1.2
			271	18240	1.2
			272	18300	1.2
			273	18360	1.2
			274	18420	1.2
			275	18480	1.2
			276	18540	1.2
			277	18600	1.2
			278	18660	1.2
			279	18720	1.2
			280	18780	1.2
			281	18840	1.2
			282	18900	1.2
			283	18960	1.2
			284	19020	1.2
			285	19080	1.2
			286	19140	1.2
			287	19200	1.2
			288	19260	1.2
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			290	19380	1.2
			291	19440	1.2
			292	19500	1.2
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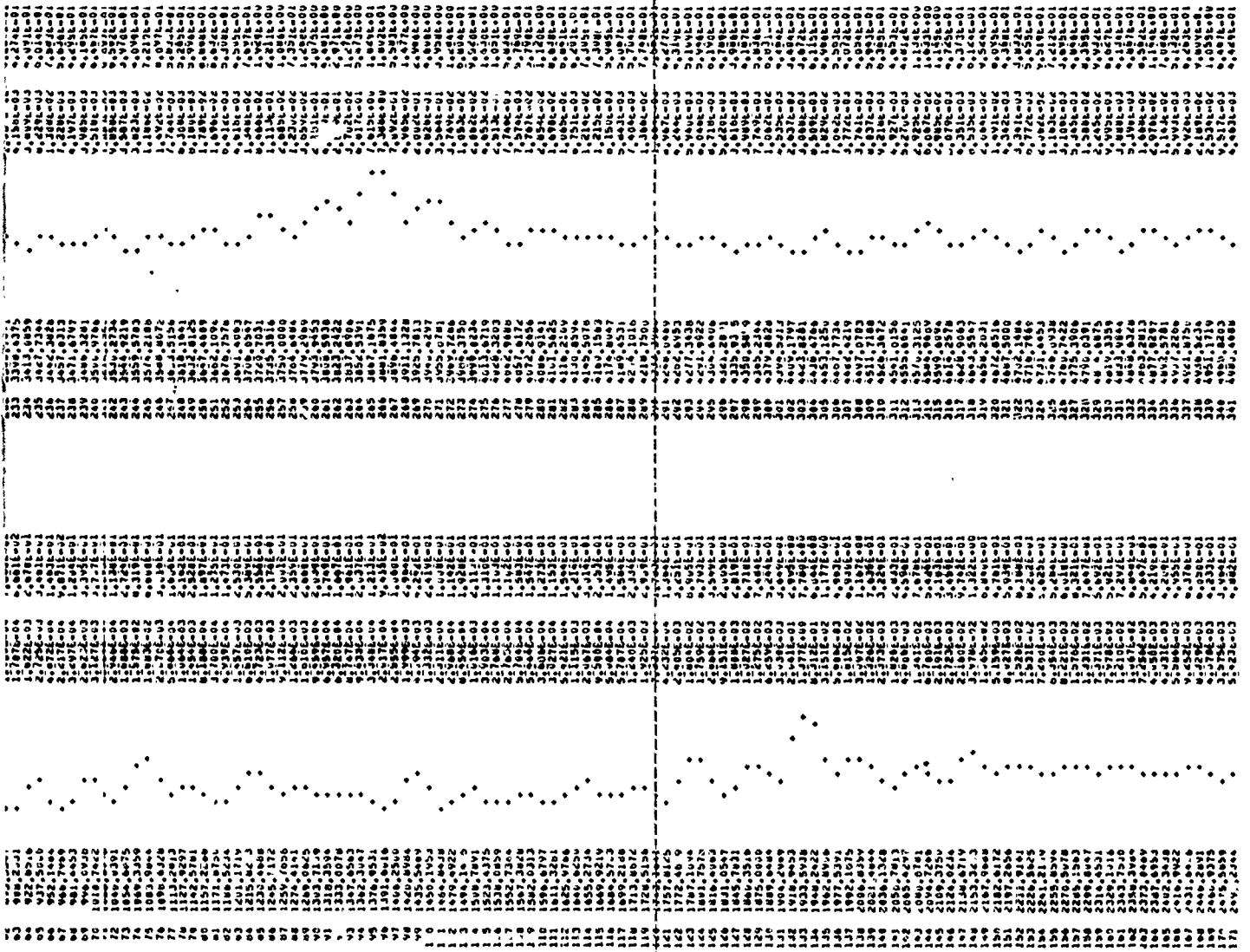




Task	CU	Comment	SWATCH NO.	Item Serial No.
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0334	115	1	119	AS00216
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0336	115	1	121	AS00214
0337	115	1	122	AS00213
0338	115	1	123	AS00212
0339	115	1	124	AS00211
0340	115	1	125	AS00210
0341	115	1	126	AS00209
0342	115	1	127	AS00208
0343	115	1	128	AS00207
0344	115	1	129	AS00206
0345	115	1	130	AS00205
0346	115	1	131	AS00204
0347	115	1	132	AS00203
0348	115	1	133	AS00202
0349	115	1	134	AS00201
0350	115	1	135	AS00200
0351	115	1	136	AS00199
0352	115	1	137	AS00198
0353	115	1	138	AS00197
0354	115	1	139	AS00196
0355	115	1	140	AS00195
0356	115	1	141	AS00194
0357	115	1	142	AS00193
0358	115	1	143	AS00192
0359	115	1	144	AS00191
0360	115	1	145	AS00190
0361	115	1	146	AS00189
0362	115	1	147	AS00188
0363	115	1	148	AS00187
0364	115	1	149	AS00186
0365	115	1	150	AS00185
0366	115	1	151	AS00184
0367	115	1	152	AS00183
0368	115	1	153	AS00182
0369	115	1	154	AS00181
0370	115	1	155	AS00180
0371	115	1	156	AS00179
0372	115	1	157	AS00178
0373	115	1	158	AS00177
0374	115	1	159	AS00176
0375	115	1	160	AS00175
0376	115	1	161	AS00174
0377	115	1	162	AS00173
0378	115	1	163	AS00172
0379	115	1	164	AS00171
0380	115	1	165	AS00170
0381	115	1	166	AS00169
0382	115	1	167	AS00168
0383	115	1	168	AS00167
0384	115	1	169	AS00166
0385	115	1	170	AS00165
0386	115	1	171	AS00164
0387	115	1	172	AS00163
0388	115	1	173	AS00162
0389	115	1	174	AS00161
0390	115	1	175	AS00160
0391	115	1	176	AS00159
0392	115	1	177	AS00158
0393	115	1	178	AS00157
0394	115	1	179	AS00156
0395	115	1	180	AS00155
0396	115	1	181	AS00154
0397	115	1	182	AS00153
0398	115	1	183	AS00152
0399	115	1	184	AS00151
0400	115	1	185	AS00150

ITEM SPLEEN 63-3-6, MPH

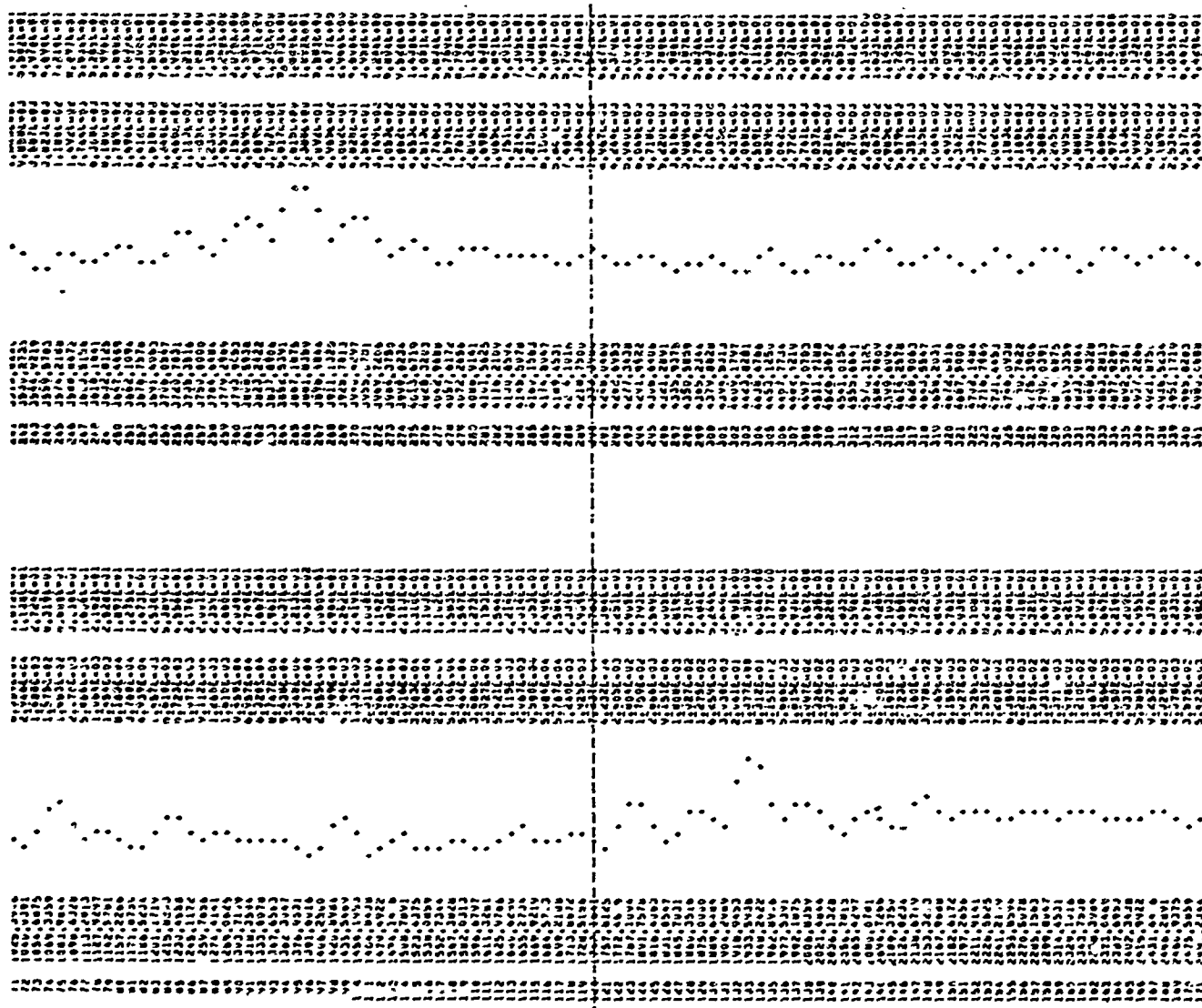
FREQUENCY RANGE 3.000 - 41.973 MHz																												
UNIT	FREQ	UNIT/100K										PHI	INCL	UNIT/100K										PHI	INCL	UNIT/100K		
2	16.0000	2.595E-02										1.079E-01	172	250	2.595E-02										1.079E-01	172	250	UNIT/100K
3	20.2000	1.576E-02										6.561E-01	173	251	1.576E-02										6.561E-01	173	251	UNIT/100K
4	24.4000	5.377E-03										2.968E-01	174	252	5.377E-03										2.968E-01	174	252	UNIT/100K
5	28.6000	5.377E-03										2.968E-01	175	253	5.377E-03										2.968E-01	175	253	UNIT/100K
6	32.8000	5.377E-03										2.968E-01	176	254	5.377E-03										2.968E-01	176	254	UNIT/100K
7	37.0000	7.700E-03										1.068E-01	177	255	7.700E-03										1.068E-01	177	255	UNIT/100K
8	41.2000	6.925E-03										1.068E-01	178	256	6.925E-03										1.068E-01	178	256	UNIT/100K
9	45.4000	6.925E-03										1.068E-01	179	257	6.925E-03										1.068E-01	179	257	UNIT/100K
10	49.6000	6.925E-03										1.068E-01	180	258	6.925E-03										1.068E-01	180	258	UNIT/100K
11	53.8000	6.925E-03										1.068E-01	181	259	6.925E-03										1.068E-01	181	259	UNIT/100K
12	58.0000	6.925E-03										1.068E-01	182	260	6.925E-03										1.068E-01	182	260	UNIT/100K
13	62.2000	6.925E-03										1.068E-01	183	261	6.925E-03										1.068E-01	183	261	UNIT/100K
14	66.4000	6.925E-03										1.068E-01	184	262	6.925E-03										1.068E-01	184	262	UNIT/100K
15	70.6000	6.925E-03										1.068E-01	185	263	6.925E-03										1.068E-01	185	263	UNIT/100K
16	74.8000	6.925E-03										1.068E-01	186	264	6.925E-03										1.068E-01	186	264	UNIT/100K
17	79.0000	6.925E-03										1.068E-01	187	265	6.925E-03										1.068E-01	187	265	UNIT/100K
18	83.2000	6.925E-03										1.068E-01	188	266	6.925E-03										1.068E-01	188	266	UNIT/100K
19	87.4000	6.925E-03										1.068E-01	189	267	6.925E-03										1.068E-01	189	267	UNIT/100K
20	91.6000	6.925E-03										1.068E-01	190	268	6.925E-03										1.068E-01	190	268	UNIT/100K
21	95.8000	6.925E-03										1.068E-01	191	269	6.925E-03										1.068E-01	191	269	UNIT/100K
22	100.0000	6.925E-03										1.068E-01	192	270	6.925E-03										1.068E-01	192	270	UNIT/100K
23	104.2000	6.925E-03										1.068E-01	193	271	6.925E-03										1.068E-01	193	271	UNIT/100K
24	108.4000	6.925E-03										1.068E-01	194	272	6.925E-03										1.068E-01	194	272	UNIT/100K
25	112.6000	6.925E-03										1.068E-01	195	273	6.925E-03										1.068E-01	195	273	UNIT/100K
26	116.8000	6.925E-03										1.068E-01	196	274	6.925E-03										1.068E-01	196	274	UNIT/100K
27	121.0000	6.925E-03										1.068E-01	197	275	6.925E-03										1.068E-01	197	275	UNIT/100K
28	125.2000	6.925E-03										1.068E-01	198	276	6.925E-03										1.068E-01	198	276	UNIT/100K
29	129.4000	6.925E-03										1.068E-01	199	277	6.925E-03										1.068E-01	199	277	UNIT/100K
30	133.6000	6.925E-03										1.068E-01	200	278	6.925E-03										1.068E-01	200	278	UNIT/100K
31	137.8000	6.925E-03										1.068E-01	201	279	6.925E-03										1.068E-01	201	279	UNIT/100K
32	142.0000	6.925E-03										1.068E-01	202	280	6.925E-03										1.068E-01	202	280	UNIT/100K
33	146.2000	6.925E-03										1.068E-01	203	281	6.925E-03										1.068E-01	203	281	UNIT/100K
34	150.4000	6.925E-03										1.068E-01	204	282	6.925E-03										1.068E-01	204	282	UNIT/100K
35	154.6000	6.925E-03										1.068E-01	205	283	6.925E-03										1.068E-01	205	283	UNIT/100K
36	158.8000	6.925E-03										1.068E-01	206	284	6.925E-03										1.068E-01	206	284	UNIT/100K
37	163.0000	6.925E-03										1.068E-01	207	285	6.925E-03										1.068E-01	207	285	UNIT/100K
38	167.2000	6.925E-03										1.068E-01	208	286	6.925E-03										1.068E-01	208	286	UNIT/100K
39	171.4000	6.925E-03										1.068E-01	209	287	6.925E-03										1.068E-01	209	287	UNIT/100K
40	175.6000	6.925E-03										1.068E-01	210	288	6.925E-03										1.068E-01	210	288	UNIT/100K
41	179.8000	6.925E-03										1.068E-01	211	289	6.925E-03										1.068E-01	211	289	UNIT/100K
42	184.0000	6.925E-03										1.068E-01	212	290	6.925E-03										1.068E-01	212	290	UNIT/100K
43	188.2000	6.925E-03										1.068E-01	213	291	6.925E-03										1.068E-01	213	291	UNIT/100K
44	192.4000	6.925E-03										1.068E-01	214	292	6.925E-03										1.068E-01	214	292	UNIT/100K
45	196.6000	6.925E-03										1.068E-01	215	293	6.925E-03										1.068E-01	215	293	UNIT/100K
46	200.8000	6.925E-03										1.068E-01	216	294	6.925E-03										1.068E-01	216	294	UNIT/100K
47	205.0000	6.925E-03										1.068E-01	217	295	6.925E-03										1.068E-01	217	295	UNIT/100K
48	209.2000	6.925E-03										1.068E-01	218	296	6.925E-03										1.068E-01	218	296	UNIT/100K
49	213.4000	6.925E-03										1.068E-01	219	297	6.925E-03										1.068E-01	219	297	UNIT/100K
50	217.6000	6.925E-03										1.068E-01	220	298	6.925E-03										1.068E-01	220	298	UNIT/100K
51	221.8000	6.925E-03										1.068E-01	221	299	6.925E-03										1.068E-01	221	299	UNIT/100K
52	226.0000	6.925E-03										1.068E-01	222	300	6.925E-03										1.068E-01	222	300	UNIT/100K
53	230.2000	6.925E-03										1.068E-01	223	301	6.925E-03										1.068E-01	223	301	UNIT/100K
54	234.4000	6.925E-03										1.068E-01	224	302	6.925E-03										1.068E-01	224	302	UNIT/100K
55	238.6000	6.925E-03										1.068E-01	225	303	6.925E-03										1.068E-01	225	303	UNIT/100K
56	242.8000	6.925E-03										1.068E-01	226	304	6.925E-03										1.068E-01	226	304	UNIT/100K
57	247.0000	6.925E-03										1.068E-01	227	305	6.925E-03										1.068E-01	227	305	UNIT/100K
58	251.2000	6.925E-03										1.068E-01	228	306	6.925E-03										1.068E-01	228	306	UNIT/100K
59	255.4000	6.925E-03										1.068E-01	229	307	6.925E-03										1.068E-01	229	307	UNIT/100K
60	259.6000	6.925E-03										1.068E-01	230	308	6.925E-03										1.068E-01	230	308	UNIT/100K
61	263.8000	6.925E-03										1.068E-01	231	309	6.925E-03										1.068E-01	231	309	UNIT/100K
62	268.0000	6.925E-03										1.068E-01	232	310	6.925E-03										1.068E-01	232	310	UNIT/100K
63	272.2000	6.925E-03										1.068E-01	233	311	6.925E-03										1.068E-01	233	311	UNIT/100K
64	276.4000	6.925E-03										1.068E-01	234	312	6.925E-03										1.068E-01	234	312	UNIT/100K
65	280.6000	6.925E-03										1.068E-01	235	313	6.925E-03										1.068E-01	235	313	UNIT/100K
66	284.8000	6.925E-03										1.068E-01	236	314	6.925E-03										1.068E-01	236	314	UNIT/100K
67	289.0000	6.925E-03										1.068E-01	237	315	6.925E-03										1.068E-01	237	315	UNIT/100K
68	293.2000	6.925E-03										1.068E-01	238	316	6.925E-03										1.068E-01	238	316	UNIT/100K
69	297.4000	6.925E-03										1.068E-01	239	317	6.925E-03										1.068E-01	239	317	UNIT/100K
70	301.6000	6.925E-03										1.068E-01	240	318	6.925E-03										1.068E-01	240	318	UNIT/100K
71	305.8000	6.925E-03										1.068E-01	241	319	6.925E-03										1.068E-01	241	319	UNIT/100K
72	310.0000	6.925E-03										1.068E-01	242	320	6.925E-03										1.068E-01	242	320	UNIT/100K
73	314.2000	6.925E-03										1.068E-01	243	321	6.925E-03										1.068E-01	243	321	UNIT/100K
74	318.4000	6.925E-03										1.068E-01	244	322	6.925E-03										1.068E-01	244	322	UNIT/100K
75	322.6000	6.925E-03										1.068E-01	245	323	6.925E-03										1.068E-01	245	323	UNIT/100K
76	326.8000	6.925E-03										1.068E-01	246	324	6.925E-03										1.068E-01	246	324	UNIT/100K
77	331.0000	6.925E-03										1.068E-01	247	325	6.925E-03										1.068E-01	247	325	UNIT/100K
78	335.2000	6.925E-03										1.068E-01	248	326	6.925E-03										1.068E-01	248	326	UNIT/100K
79	339.4000	6.925E-03										1.068E-01	249	327	6.925E-03										1.068E-01	249	327	UNIT/100K
80	343.6000	6.925E-03										1.068E-01	250	328	6.925E-03										1.068E-01	250	328	UNIT/100K
81	347.8000	6.925E-03										1.068E-01	251	329	6.925E-03										1.068E-01	251	329	UNIT/100K
82	352.0000	6.925E-03										1.068E-01	252	330	6.925E-03										1.068E-01	252	330	UNIT/100K
83	356.2000	6.925E-03										1.068E-01	253	331	6.925E-03										1.068E-01	253	331	UNIT/100K
84	360.4000	6.925E-03										1.068E-01	254	332	6.925E-03										1.068E-01	254	332	UNIT/100K
85	364.6000	6.925E-03										1.068E-01	255	333	6.925E-03										1.068E-01	255	333	UNIT/100K
86	368.8000	6.925E-03										1.068E-01	256	334	6.925E-03										1.068E-01	256	334	UNIT/100K
87	373.0000	6.925E-03										1.068E-01	257	335	6.925E-03										1.068E-01	257	335	UNIT/100K
88	377.2000	6.925E-03										1.068E-01	258	336	6.925E-03										1.068E-01	258	336	UNIT/100K
89	381.4000	6.925E-03										1.068E-01	259	337	6.925E-03										1.068E-01	259	337	UNIT/100K
90	385.6000	6.925E-03										1.068E-01	260	338	6.925E-03										1.068E-01	260	338	UNIT/100K
91	389.8000	6.925E-03										1.068E-01	261	339	6.925E-03										1.068E-01	261	339	UNIT/100K
92	394.0000	6.925E-03										1.068E-01	262	340	6.925E-03										1.068E-01	262	340	UNIT/100K
93	398.2000	6.925E-03										1.068E-01	263	341	6.925E-03										1.068E-01	263	341	UNIT/100K
94	402.4000	6.925E-03										1.068E-01	264	342	6.925E-03										1.068E-01	264	342	UNIT/100K
95	406.6000	6.925E-03										1.068E-01	265	343	6.925E-03										1.068E-01	265		



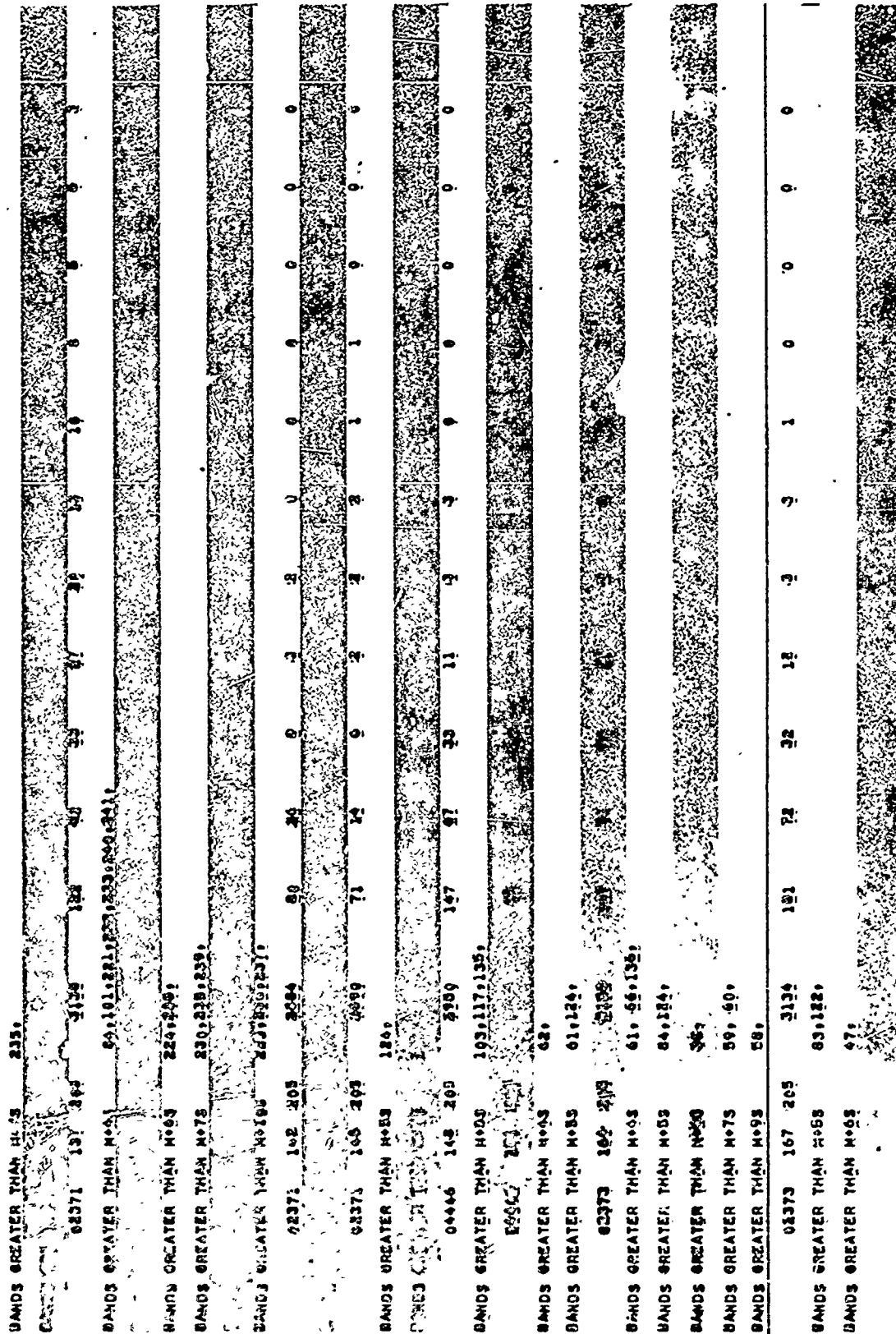
271

6-92 B

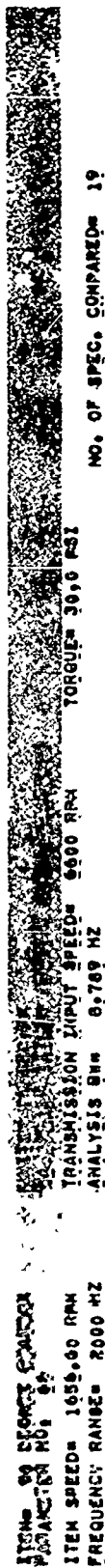
FIGURE 6-92



272



273



NO. OF SPEC. COMPARED= 19

FIGURE 6-93



THE UNIVERSITY OF ALABAMA

NUMBER OF FREQUENCY POINTS WHERE COMPARISON LEVEL IS EXCEEDED

BANDS GREATER THAN M+48 300,

MANUS CRITER THAN N-58 279.

WANTS LESS THAN \$105 243

LOC 618 11400

1950

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1. *Chlorophyll a* (Chl a) is the primary photosynthetic pigment in most plants and algae. It is a green pigment that absorbs light energy in the blue and red regions of the visible spectrum. Chl a is essential for the light-dependent reactions of photosynthesis, where it converts light energy into chemical energy in the form of ATP and NADPH.

2. *Chlorophyll b* (Chl b) is an accessory pigment found in many green plants and algae. It is a yellow-green pigment that absorbs light energy in the blue and red regions of the visible spectrum. Chl b transfers the absorbed energy to Chl a, which then uses it for photosynthesis. Chl b also plays a role in protecting Chl a from photodamage.

3. *Carotenoids* are a group of pigments found in plants and algae. They include carotenes (orange pigments) and xanthophylls (yellow pigments). Carotenoids absorb light energy in the blue and green regions of the visible spectrum and transfer the energy to Chl a. They also play a role in protecting the photosynthetic apparatus from photodamage by acting as antioxidants and quenching reactive oxygen species.

4. *Anthocyanins* are water-soluble pigments found in many plants, particularly in the leaves and fruits. They are responsible for the red, purple, and blue colors seen in many plants. Anthocyanins are thought to play a role in protecting plants from UV radiation and oxidative stress, and they may also be involved in signaling and defense mechanisms.

5. *Phycobilins* are a group of pigments found in cyanobacteria and red algae. They include phycocyanins (blue pigments) and allophycocyanins (red pigments). Phycobilins absorb light energy in the blue and green regions of the visible spectrum and transfer the energy to Chl a. They are essential for the light-dependent reactions of photosynthesis in these organisms.

ENDING COST, TAIN MO.

100

100

10

**00-08 CAYL9 THÂN MÔS**

02956 111 205

DAIDS GREATER THAN M-43 107:

014107 093770 0444 040 030-

[illegible]

1000

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1957 12 27 7 16:30

178,317 5408 NIAH 178,317

1

[illegible]

1929 6-11 1914700 30445

275

db exceedances parameter number		Run No.
12 db *64	6 db *66	
7 17, 18, 38, 245- 247, 335	4 245, 246, 274, 308	75A
20 18, 38, 45, 47, 63, 80, 81, 90, 179, 180, 189, 277, 319, 334, 335, 338-342	13 101, 175, 224- 226, 228, 233- 238, 240	135
3 17, 18, 180	0	85A
3 47, 180, 278	2 103, 104	142
2 147, 280	0	81A
3 47, 77, 335	20 84, 85, 101, 221- 227, 230, 232, 233, 235-241	137
0	0	89
2 280, 332	2 101, 124	145

FIGURE 6-94B

ADAPS - FLIGHT TEST PHASE SUMMARY				HIGH SPEED TEST RESULTS				Description of Defective Part				4 of Expediences/Parameter Number				Run No.
Part Name	Number Tested	Part Number	Defective Part Serial Number	Serial Number	Component	Serial Number	Serial Number	Serial Number	Serial Number	Serial Number	Serial Number	Serial Number	Serial Number	Serial Number	Serial Number	
Transmission	2	204-040-016-1														62
																83
																115
																119
																129
																131
																187
																190
																194
																198
																200
																203

277

Input quill ball bearing	2	204-040-346-3	K-717	ABU-10527	Rusty balls & races	55	129	27	41	10	93
			CP12-7105**	ABU-10527		3	22	1	31	27	167
Tail rotor quill ball bearing	1	204-040-143-1	B12-1862B**	ABU-10527		6	3	10	110	25	164
Tail rotor quill roller bearing	1	204-040-310-1	118520	ABU-10527	Rust pitted rollers; cut end rust pitted inner race	2	94	3	32	5	101
Main mast ball bearing	2	204-040-136-7	465	ABU-10527	Corrosive pitted races and balls	2	56	8	46	4	97
			6739	ABU-10527		1	-	26	49	-	161

\*\* Serial number of the entire quill assembly, not of the implanted defective part.

FIGURE 6-95A

125	47	exceedences/parameter number	125	Fun. No.
13, 21-24, 42, 55	129	27	10	93
63, 96-98, 101-105, 124, 125	84, 88, 91-104, 113-12, 131, 144-146, 176, 180-182, 191-193, 196, 237-240, 282-290, 293, 295, 296, 327, 328, 332-33	96, 97, 112, 127, 135, 143-146, 155, 191, 192, 197, 237-241, 245, 274, 284, 286, 314, 315, 317, 318, 321-323, 331-335	10	
2, 15, 16	22	31	27	167
2, 9, 10, 13, 14, 126	23-25, 38, 39, 88, 89, 90, 106-108, 117, 155, 156, 194, 306, 307	44, 122, 126, 131, 159, 172-176, 182, 218, 219, 243-247, 227, 248-251, 255, 258-260, 263, 274, 267, 268, 279	27	
2, 15, 16, 42, 43, 281	107, 108, 118	10, 11, 13, 16, 17, 25, 38, 40-42, 159, 172, 174-176, 178-180, 182-184, 186, 198-200, 203-205, 212, 213, 217, 222, 227, 233-249, 252, 253, 255-268, 271-294, 296, 310, 322-328, 330-336, 338-341	25	164
25, 127	8-32, 55-60, 62-75, 78-84, 92-106, 113, 114, 116-123, 127, 147-156, 159, 162, 336, 337	29-31, 38, 40, 41, 135, 136, 139, 154, 156, 157, 163, 172, 179, 180, 186, 187, 219, 220, 230-232, 246, 259	5	101

FIGURE 6-95B

#125	#47	4 σ exceedances/parameter number #123	#126	#129	Run No.
2, 75	56	8	46	4	97
	12-31, 59, 68-71, 74, 78, 79, 80, 94-98, 101-105, 107, 108, 113, 114, 116-121, 154, 155, 335, 337, 338	22, 23, 75, 76, 127, 144, 145, 321	98-108, 110, 111, 127, 252, 257, 267, 274, 275, 279, 280, 283, 284, 289, 291, 311, 314, 315, 317, 318, 321-328, 330, 332, 334-336, 339-340	127, 128, 149, 257	
1	--	26	49	--	161
2		80, 120, 125, 126, 159-172, 182, 186, 221, 222, 191, 196-198, 200	131, 137, 159, 172-176, 182, 186, 221, 222, 227, 242-253, 255-261, 263-268, 272, 276, 278, 279, 282, 284, 290, 291, 322, 324		

FIGURE 6-95C

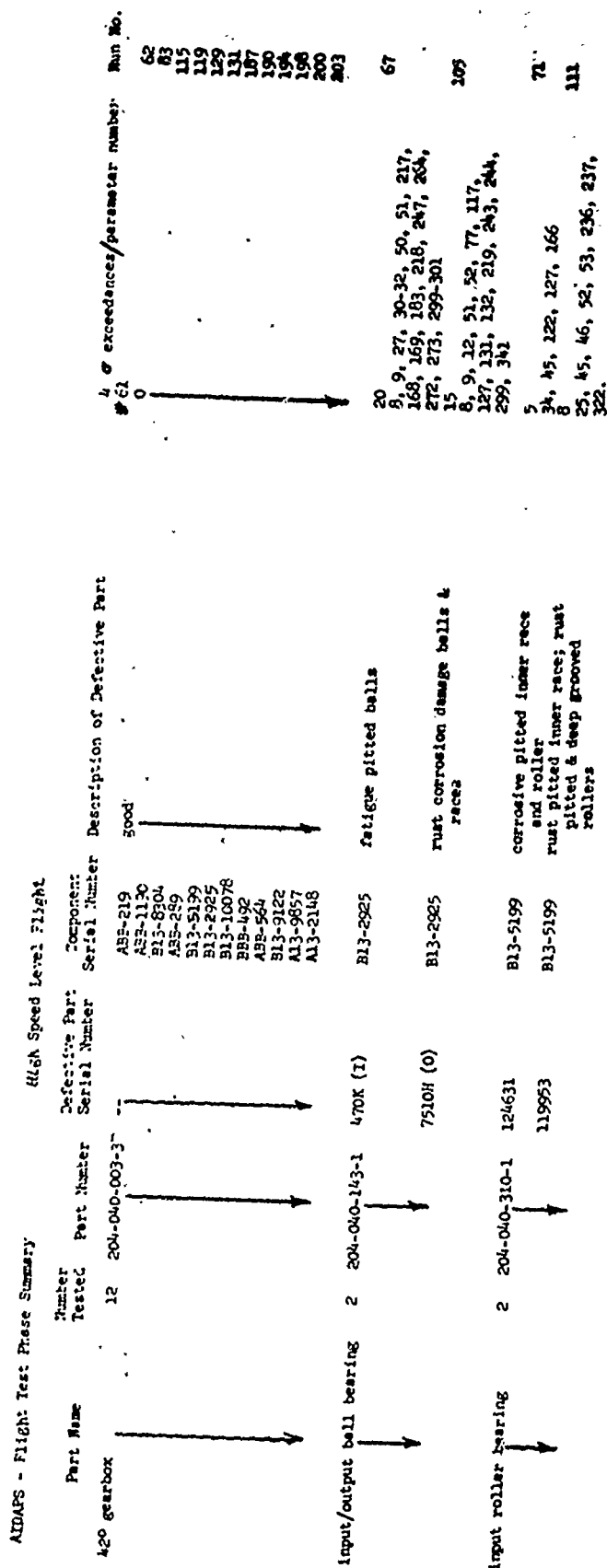


FIGURE 6-96

AIDAPS - Flight Test Phase Summary				High Speed Level Flight		Description of Defective Part	4 of Exceedances Parameter Number				Run No.
Part Name	Number Tested	Part Number	Defective Part Serial Number	Component Serial Number	#4		#7	#8			
engine	12	T53-L-13	--	LE-13669 LE-16522 LE-15615 LE-20727 LE-18993 LE-15351 LE-18270 LE-20731 LE-14819 LE-17376 LE-18301 LE-16886	good	0	0	0	62 83 115 119 129 131 187 190 194 198 200 203		
#2 main bearing	2	1-300-176-01	1025 5357	LE-15415 LE-15615	pitted outer race; excessive roller end wear corrosive pitted outer race & roller; excessive roller end wear	13 14	2 6	98 --	67 135		
#3 main bearing	2	1-300-176-01	1164 1025	LE-20727 LE-20727	pitted outer race & rollers; excessive roller end wear pitted outer race; excessive roller end wear	15 6	3 0	13 42	71 137		
#4 main bearing	2	1-300-015-04	2652 984C	LE-15351 LE-15351	pitted balls & races corrosive pitted balls; internal clearance .0004 over max.	0 .6	24 27	4 0	75A 105		
compressor	2	1-100-720-18	M40543 M42072	LE-15415 LE-18993	compressor F.O.D. (bad); unbalance compressor F.O.D.; unbalance	5 17	3 6	10 4	85A 142		
power turbine	2	N.A.	3888 N.A.	LE-20727 LE-15351	out of balance; bad carbon seals (P5619) rotor warped and out of balance	16 4	5 3	16 7	89 145		
M1 nozzle	2	N.A.	98128 76-157	LE-18993 LE-15615	N.A. N.A.	5 8	7 0	3 5	81A 146		
M2 nozzle	2	N.A.	96005 N.A.	LE18993 LE-20727	N.A. N.A.	6 11	5 0	0 42	111 153		
fuel control	5	N.A.	N.A.	LE16522	out of spec. droop curve 1 turn lean 1 turn lean 1 turn rich 1 turn rich	5 5 8 8	9 6 7 9	0 3 2 2	194A 154A 156 157 158		

FIGURE 6-97A



Exceedance/parameter number	Exceedance/parameter number	Exceedance/parameter number	Exceedance/parameter number
42-44, 51, 52, 123-126, 113, 229 295-297, 311	2-23, 27-28, 51-54, 57- 59, 61-62, 68-71, 100 103, 104, 109, 156, 271, 272, 312, 313-320, 325, 326, 327, 330, 331, 334, 335, 342	2-23, 27-28, 51-54, 57- 59, 61-62, 68-71, 100 103, 104, 109, 156, 271, 272, 312, 313-320, 325, 326, 327, 330, 331, 334, 335, 342	135
39-46, 53, 110, 112, 113, 107, 105, 159-161, 199 199, 295	14	14	135
29, 30, 38, 39, 42-47, 145 113, 114, 226 168, 275, 321, 322	15	13	71
28, 29, 201, 305, 327, 328	5	42	137
45, 113, 121, 122, 318, 319	6	55, 56, 61-63, 65, 66, 70, 77, 94, 95, 99, 100, 101, 103, 104, 194, 256, 257, 259, 267, 291, 306, 309, 310, 320, 325-331, 334- 342	137
37, 111, 221, 249, 277	5	253, 254, 309, 311	75A
57, 58, 85, 105, 113, 169, 8, 9, 40-42, 47, 170, 225, 248, 249, 252, 253, 281, 282, 309-311	17	29, 30, 220-222, 248-250, 253, 260	85A
39-45, 97, 99, 103, 104, 249, 273, 274, 318, 319	16	113, 281, 308, 309	142
2, 29, 30, 201	4	200, 267, 300-302, 310, 311, 318-322, 324, 325, 328, 329	89
	3	30, 190, 196, 254, 309- 311	145

FIGURE 6-97B

σ exceedances parameter number				Run No.
# 4	# 7	# 2		
201, 202, 221, 222, 309	14, 64, 113, 161, 162, 201, 225	193, 276, 291,		514
34, 38, 39, 42, 226, 274, 300, 301	0	219, 220, 274, 275, 303		146
60, 61, 219, 236, 308, 309	2, 40-42, 64	0		111
29, 30, 42, 44, 57, 277, 278, 308-311	0	30, 56-63, 66, 67, 70, 71, 95, 100, 171, 194, 253, 257-262, 267, 274-276, 281, 291, 309-311, 317, 318, 320, 322, 325, 326, 331, 334, 335		151
110, 192, 198, 199, 218	47, 52, 53, 56, 158-160, 198, 199	0		154A
108, 200, 201, 221, 322	160, 161, 162, 200, 201, 339	271, 325, 326		155A
110, 195, 196, 216, 322	157, 158, 195, 196, 216, 217, 339	327, 328		156
110, 195-197, 215, 236-238	157, 158, 195-197, 215, 216, 339, 340	327, 328		157
109, 110, 198, 199, 218, 219, 235, 236	48, 159, 160, 198, 217-219, 332, 339	271, 325		158

FIGURE 6-97C

TABLE 6.1

## GAS PATH PARAMETERS

Per % Change in % Change In	$T5/\theta_1$	$N1/\sqrt{\theta_1}$	Pumping Capacity $\Gamma_1$	$\eta_c$	$\eta_b$	$A_5$	$n_t$	$\eta_{PT}$
$T5/\theta_1$	1	0	0	0	0	0	0	0
$N1/\sqrt{\theta_1}$	0	1	0	0	0	0	0	0
$\Gamma_1$	$C_{11}$	$C_{21}$	$C_{31}$	$C_{41}$	0	$C_{61}$	$C_{71}$	0
$T3/\theta_1$	$C_{12}$	$C_{22}$	$C_{32}$	$C_{42}$	0	$C_{62}$	$C_{72}$	0
$P3/\delta_1$	$C_{13}$	$C_{23}$	$C_{33}$	$C_{43}$	0	$C_{63}$	$C_{73}$	0
$Wf/\delta_1\theta_1$	$C_{14}$	$C_{24}$	$C_{34}$	$C_{44}$	1	$C_{64}$	$C_{74}$	0
$T7/\theta_1$	$C_{15}$	$C_{25}$	$C_{35}$	$C_{45}$	0	$C_{65}$	$C_{75}$	0
$P7/\delta_1$	$C_{16}$	$C_{26}$	$C_{36}$	$C_{46}$	0	$C_{66}$	$C_{76}$	0
$HP/\delta_1\sqrt{\theta_1}$	$C_{17}$	$C_{27}$	$C_{37}$	$C_{47}$	0	$C_{67}$	$C_{77}$	$C_{87}$
$T9/\theta_1$	$C_{18}$	$C_{28}$	$C_{38}$	$C_{48}$	0	$C_{68}$	$C_{78}$	$C_{88}$
$A\eta$	$C_{19}$	$C_{29}$	$C_{39}$	$C_{49}$	0	$C_{69}$	$C_{79}$	$C_{89}$

TABLE 6.2

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T53 L13 FAULT COEFFICIENTS ( $N_1/\sqrt{\theta_1} = 23400$ )

MEASURED	COMPRESSOR		GAS GEN. TURBINE		POWER TURBINE		BURNER
	-1%	-1%	+1%	-1%	+1%	-1%	-1%
$\Delta'S$ at	$\Delta r$	$\Delta \eta_c$	$\Delta A_5$	$\Delta \eta_g$	$\Delta A_n$	$\Delta \eta_{PT}$	$\Delta \eta_b$
$N_1 = \phi$ $\sqrt{\theta_1}$							
$\% \Delta N_1/\sqrt{\theta_1}$	0	0	0	0	0	0	0
$\% \Delta T3/\theta_1$	-0.27	0.59	-0.15	0.15	-0.12	0	0
$\% \Delta P3/\delta_1$	-0.84	0.42	-0.46	0.46	-0.38	0	0
$\% \Delta Wf/\delta_1 \theta_1^y$	-1.38	1.92	1.35	2.55	-1.73	0	1.0
$\% \Delta hp/\delta_1 \sqrt{\theta_1}$	-1.79	1.38	1.27	1.57	-2.05	-1.0	0
$\% \Delta T9/\theta_1$	-0.29	1.14	0.55	1.47	-0.84	0.18	0
$P3/\delta_1$ $= \phi$							
$\% \Delta N_1/\sqrt{\theta_1}$	0.30	-0.15	0.17	-0.17	0.14	0	0
$\% \Delta T3/\theta_1$	0	0.45	0	0	0	0	0
$\% \Delta P3/\delta_1$	0	0	0	0	0	0	0
$\% \Delta Wf/\delta_1 \theta_1^y$	0	1.23	2.10	2.38	-1.10	0	1.0
$\% \Delta hp/\delta_1 \sqrt{\theta_1}$	0	0.21	2.23	0.57	-1.23	+1.0	0
$\% \Delta T9/\theta_1$	0	1.0	0.61	1.31	-0.71	0.18	0
$WF$ $\delta_1 \theta_1^y$ $= \phi$							
$\% \Delta N_1/\sqrt{\theta_1}$	0.30	-0.42	-0.30	-0.56	0.38	0	-0.22
$\% \Delta T3/\theta_1$	0	0.21	-0.41	-0.47	0.21	0	-0.20
$\% \Delta P3/\delta_1$	0	-0.74	-1.27	-1.37	0.66	0	-0.61
$\% \Delta Wf/\delta_1 \theta_1^y$	0	0	0	0	0	0	0
$\% \Delta hp/\delta_1 \sqrt{\theta_1}$	0	-0.38	-0.48	-2.48	0.19	-1.0	-1.30
$\% \Delta T9/\theta_1$	0	0.74	0.27	0.97	-0.48	0.18	-0.21
$HP$ $\delta_1 \sqrt{\theta_1}$ $= \phi$							
$\% \Delta N_1/\sqrt{\theta_1}$	0.30	-0.19	-0.21	27	0.35	0.17	0
$\% \Delta T3/\theta_1$	0	0.42	-0.33	19	0.19	0.15	0
$\% \Delta P3/\delta_1$	0	-0.10	-1.04	27	0.58	0.46	0
$\% \Delta Wf/\delta_1 \theta_1^y$	0	1.06	0.39	1.33	-0.14	0.77	0
$\% \Delta hp/\delta_1 \sqrt{\theta_1}$	0	0	0	0	0	0	0
$\% \Delta T9/\theta_1$	0	0.97	0.35	1.22	-0.51	0.34	0

TABLE 6-3 AIDAPS GAS PATH ANALYSIS SUMMARY FOR SIGNATURE DEFINITIONS

CONSIDERATIONS: DIAGNOSTICS OBTAINED WITH DEGRADATIONS OF LESS THAN 5%

INSERTED COMPONENT	BASELINE = $f(P_{22}/A_1)$		BASELINE = $f(P_{22}/A_1)$		ANALYSIS OF TEST CELL DATA
	WITH NOISE REJECTION	WITHOUT NOISE REJECTION	WITH NOISE REJECTION	WITHOUT NOISE REJECTION	
Bearing 2 (LE 15615)	No Gas Path Fault (Correct Diagnostic)	No Gas Path Fault (Correct Diagnostic)	Degraded N <sub>1</sub> Nozzles Degraded Compressor (Wrong Diagnostic)	Degraded Compressor Degraded N <sub>1</sub> Nozzles (Wrong Diagnostic)	No Gas Path Fault (Correct Diagnostic)
Bearing 3 (LE 20727)	No Gas Path Fault (Correct Diagnostic)	Degraded N <sub>2</sub> Turbine (Wrong Diagnostic)	No Gas Path Fault (Correct Diagnostic)	Degraded N <sub>2</sub> Turbine Degraded N <sub>1</sub> Turbine (Wrong Diagnostic)	No Gas Path Fault (Correct Diagnostic)
Bearing 4 (LE 15351)	No Gas Path Fault (Correct Diagnostic)	Degraded N <sub>2</sub> Turbine (Wrong Diagnostic)	No Gas Path Fault (Correct Diagnostic)	Degraded N <sub>2</sub> Turbine Degraded N <sub>1</sub> Turbine Degraded Compressor (Wrong Diagnostic)	No Gas Path Fault (Correct Diagnostic)
N <sub>1</sub> Nozzles (LE 15615)	No Gas Path Fault (Possible Diagnostic)	Degraded N <sub>2</sub> Turbine (Wrong Diagnostic)	Degraded N <sub>2</sub> Turbine Degraded N <sub>1</sub> Nozzles (Wrong Diagnostic)	Degraded N <sub>2</sub> Turbine Degraded N <sub>1</sub> Nozzles (Wrong Diagnostic)	No Gas Path Fault (Possible Diagnostic)
N <sub>2</sub> Nozzles (LE 18993)	Degraded N <sub>2</sub> Turbine Degraded Compressor Degraded N <sub>1</sub> Turbine (Isolated Primary Fault)	Degraded N <sub>2</sub> Turbine Degraded Compressor (Isolated Primary Fault)	Degraded N <sub>2</sub> Turbine (Correct Diagnostic)	Degraded N <sub>2</sub> Turbine Degraded Compressor (Isolated Primary Fault)	Degraded Compressor Degraded N <sub>1</sub> Turbine Degraded N <sub>2</sub> Turbine (Wrong Diagnostic)
N <sub>2</sub> Nozzles (LE 20727)	No Gas Path Fault (Possible Diagnostic)	Degraded N <sub>2</sub> Turbine (Correct Diagnostic)	No Gas Path Fault (Possible Diagnostic)	No Gas Path Fault (Possible Diagnostic)	No Gas Path Fault (Possible Diagnostic)
N <sub>2</sub> Turbine (LE 15351)	No Gas Path Fault (Possible Diagnostic)	No Gas Path Fault (Possible Diagnostic)	No Gas Path Fault (Possible Diagnostic)	Degraded N <sub>1</sub> Turbine Degraded N <sub>1</sub> Turbine (Isolated Primary Fault)	No Gas Path Fault (Possible Diagnostic)
Compressor (LE 15615) (Node 1)	Degraded N <sub>2</sub> Turbine (Wrong Diagnostic)	Degraded N <sub>1</sub> Turbine (Wrong Diagnostic)	Degraded N <sub>1</sub> Turbine (Wrong Diagnostic)	Degraded N <sub>1</sub> Turbine Degraded Compressor (Wrong Diagnostic)	Degraded Compressor Degraded N <sub>1</sub> Nozzle Degraded N <sub>2</sub> Turbine (Isolated Primary Fault)

Possible Diagnostic Indicates Part Deterioration May Not Be Sufficient To Warrant Removal.

Note 1: Compressor Data Was Obtained Before Final Data Acquisition Technique Was Established.

TABLE 6.4

Possible frequencies associated with pits on the inner, outer races and elements of the 42° gearbox bearing assembly.

		F1 (Hz)					
		Ball	Roller				
		--	32				
		12	100	Fo (Hz)		Fb (Hz)	
		80	168	Ball	Roller	Ball	Roller
Sideband Structure		148	236	6	58	56	27
		216	304	74	126	124	95
		284	372	142	194	192	163
		352	440	210	262	260	231
		420	508	278	330	328	299
		488	576	346	398	396	367
Fundamental Sideband structure		556	664	414	466	464	435
		624	732	482	534	532	503
		692	800	550	602	600	571
		760	868	618	670	668	639
		828	936	686	738	736	707
		896	1004	754	806	804	775
		964	1072	822	874	872	843
		1032	1140	890	942	940	911
		1100	1208	958	1010	1008	979

F<sub>B</sub> = 198 Hz for ball, 183 Hz for roller.

F<sub>P</sub> = 28.8 Hz.

F<sub>R</sub> = 68 Hz.

SECTION 7

VERIFICATION TEST ANALYSIS

BAR

DATA DISPLAYED

|||||

FLIGHT TEST - Flight Baseline

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FLIGHT TEST - Average Baseline for 10 AIDAPS  
Engines

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FLIGHT TEST - Baseline derived from Lycoming  
Model Spec.

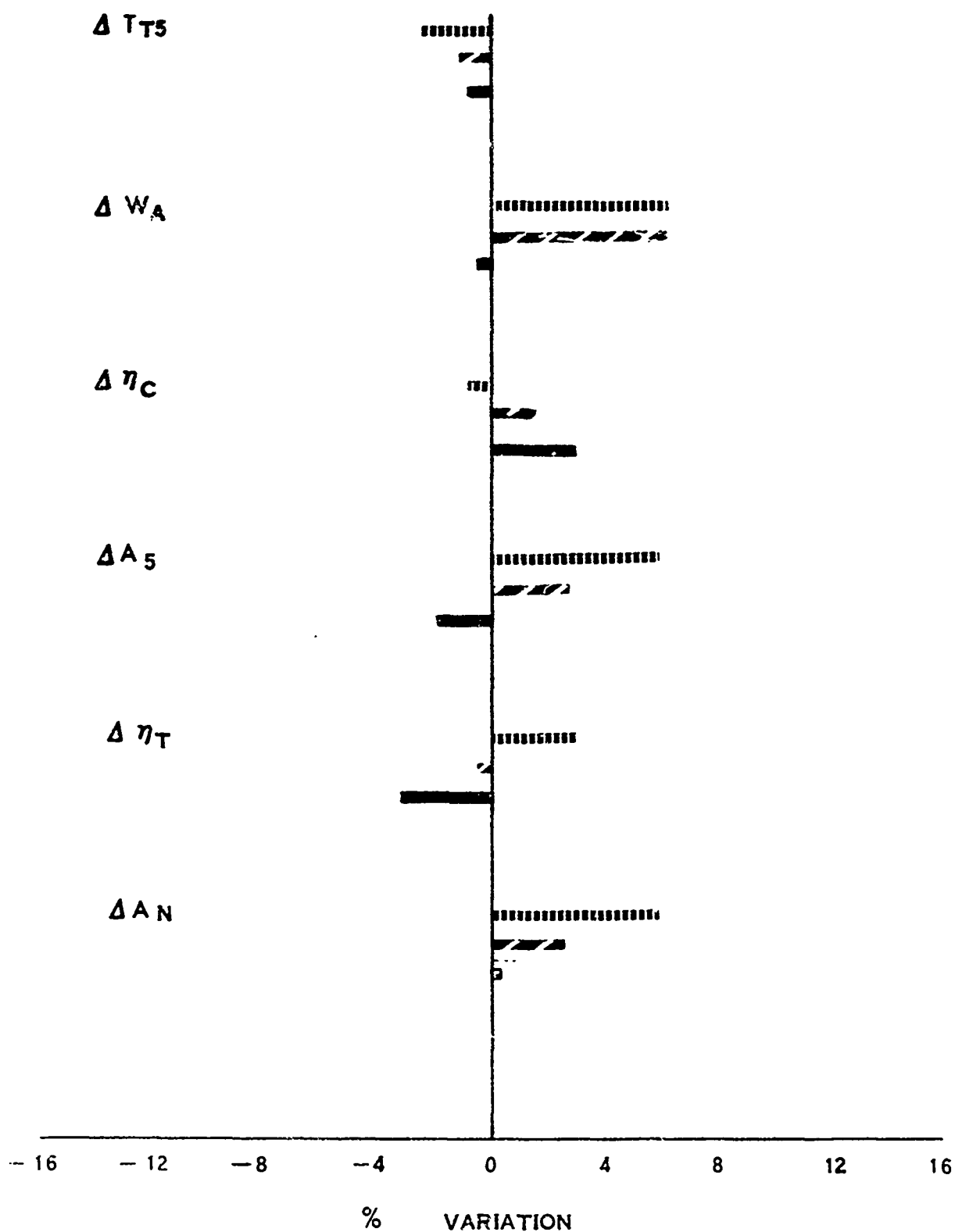
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ARADMAC TEST - ARADMAC Baseline

FIGURE 7-1

DEFINITION OF BASELINE FOR FIGURES 7-2 THROUGH 7-13





ANALYSIS OF VERIFICATION ENGINE LE 18270

FIGURE 7-2

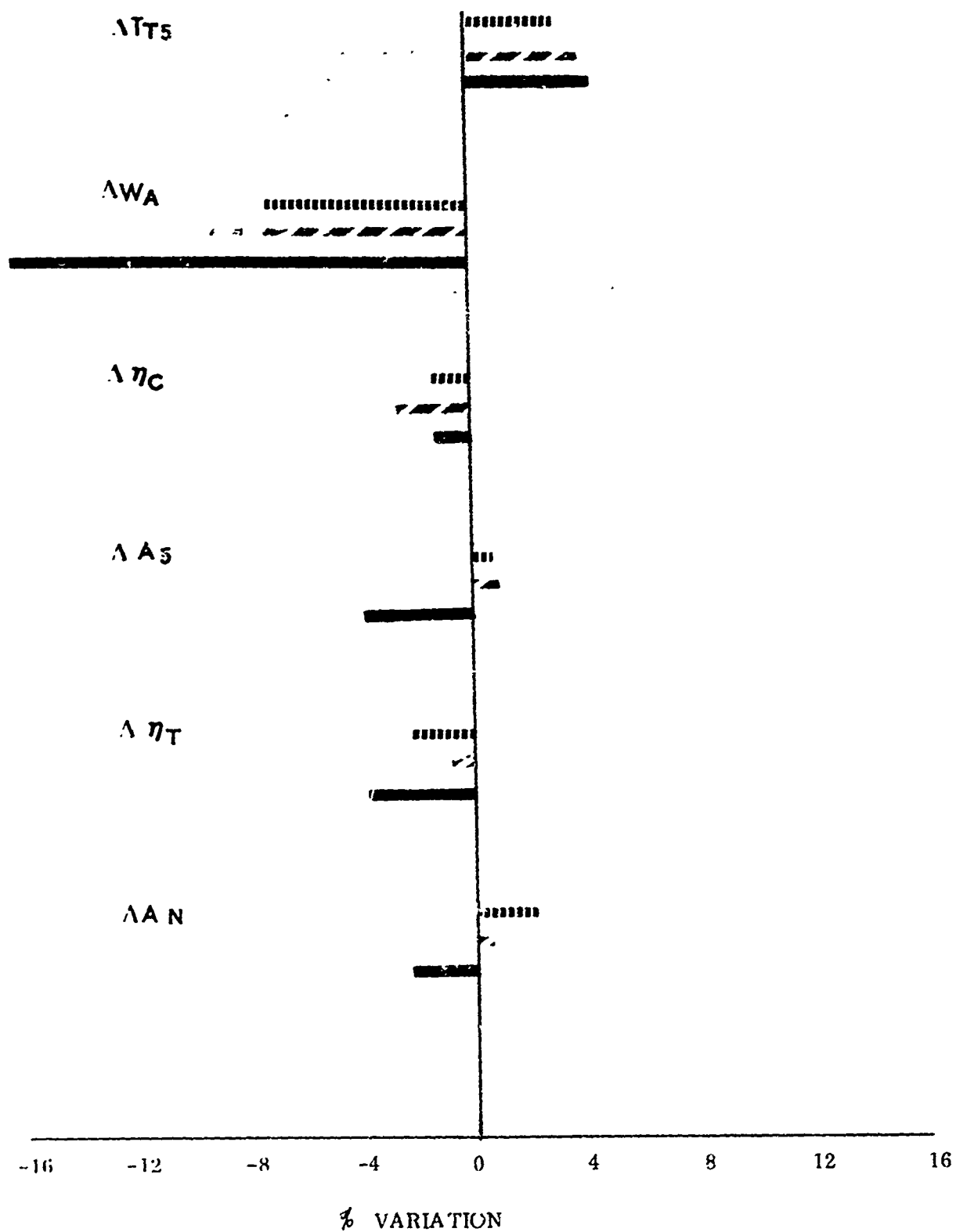


FIGURE 7-3

ANALYSIS OF VERIFICATION ENGINE LE 20791

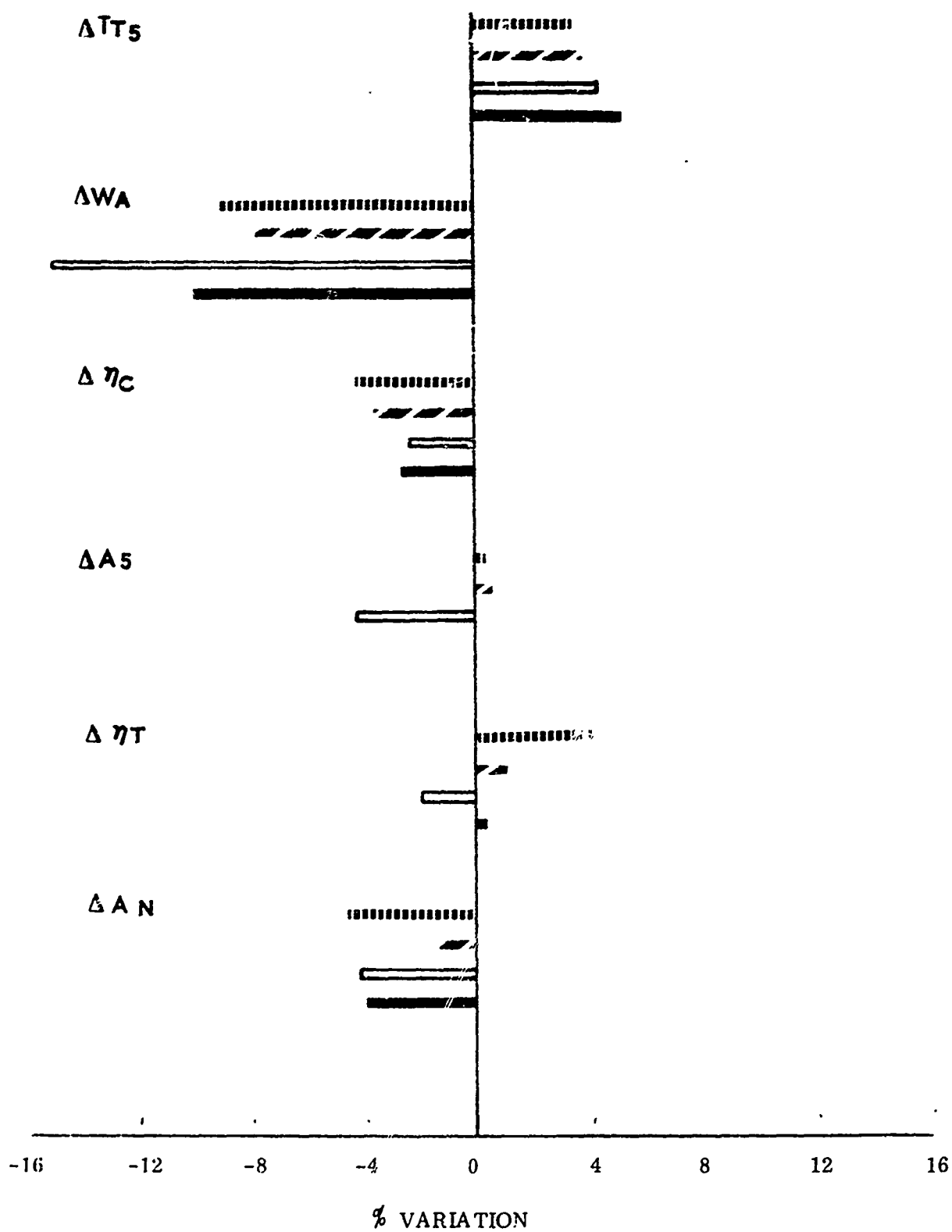


FIGURE 7-4

ANALYSIS OF VERIFICATION ENGINE LE 14819

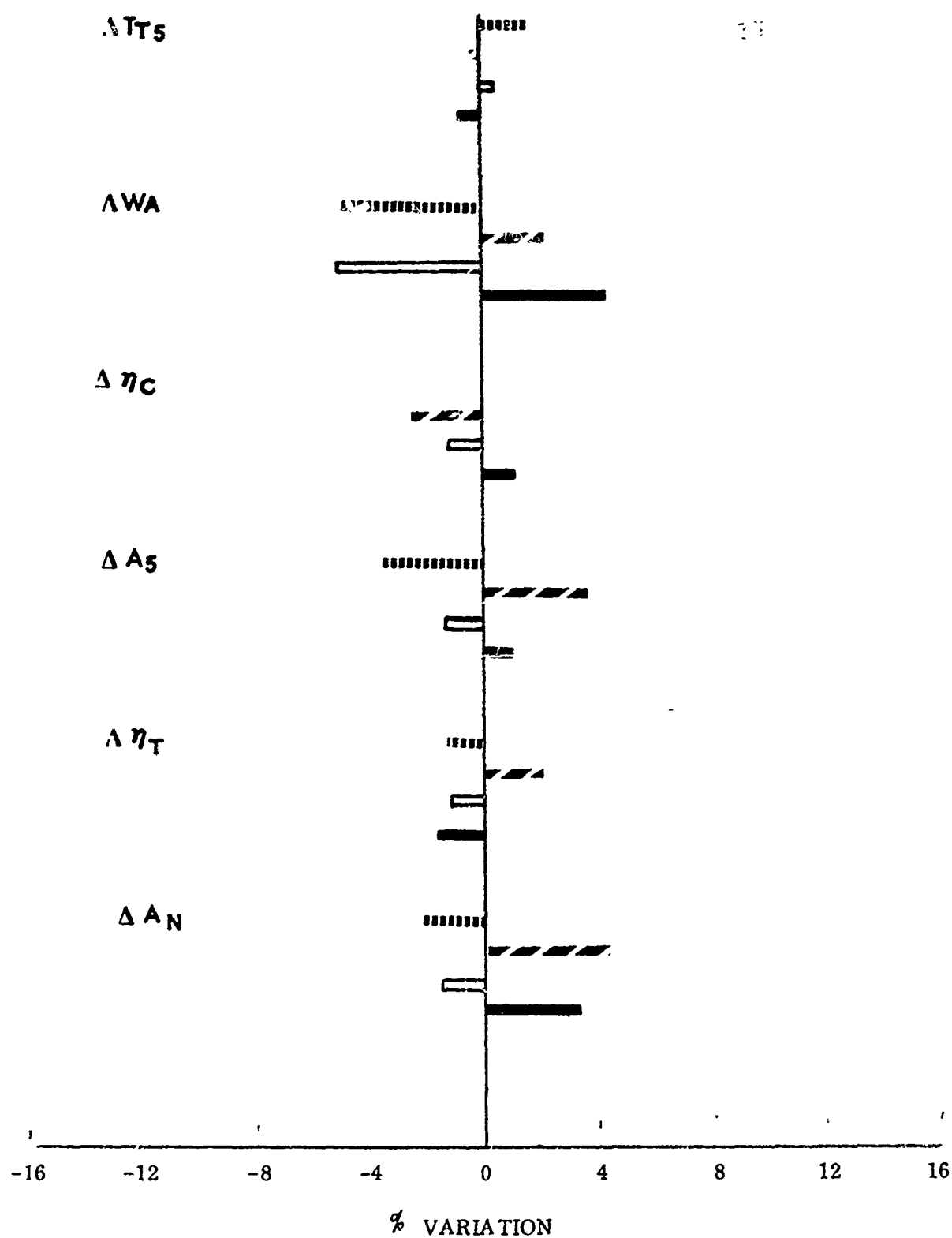
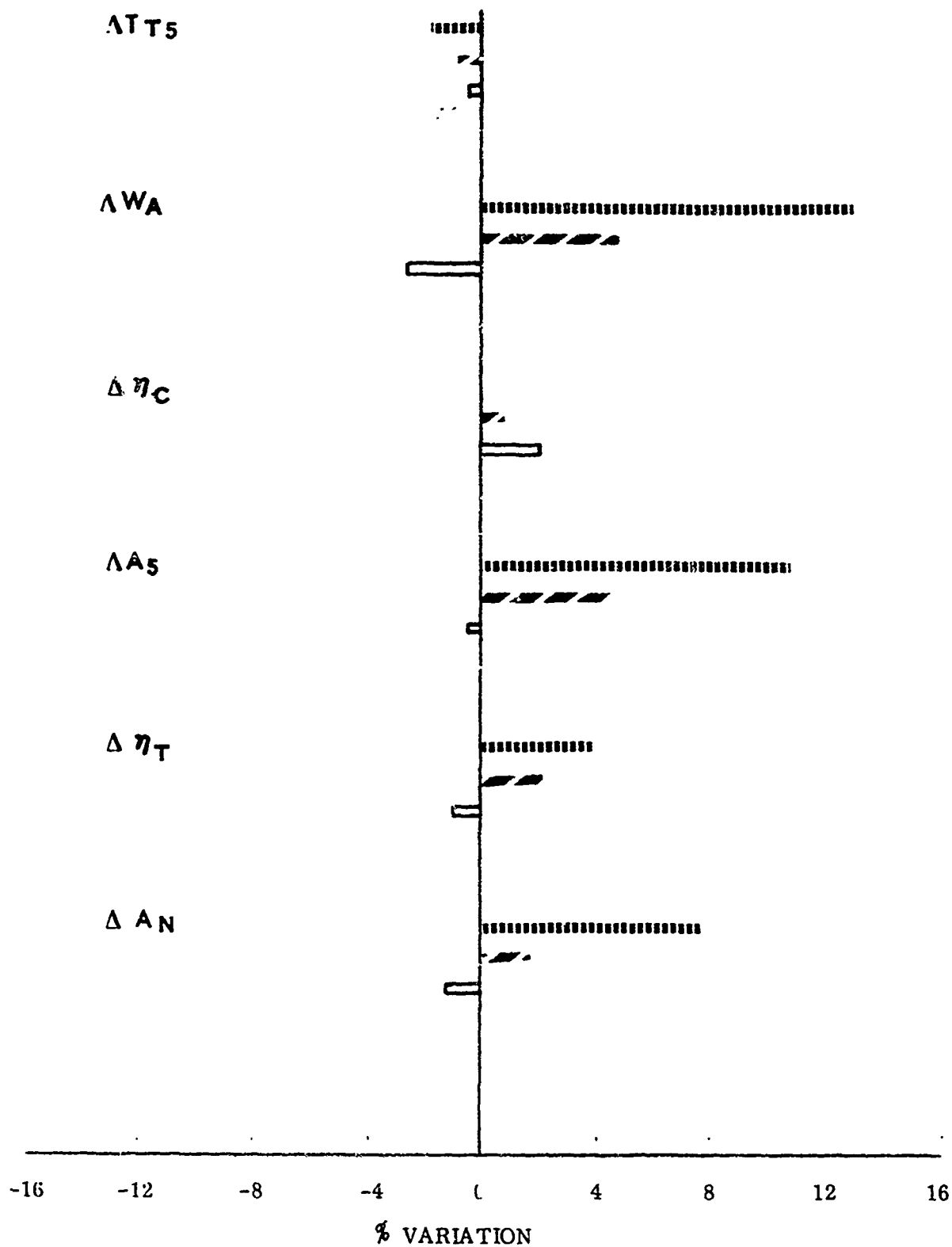


FIGURE 7-5

ANALYSIS OF VERIFICATION ENGINE LE 17376



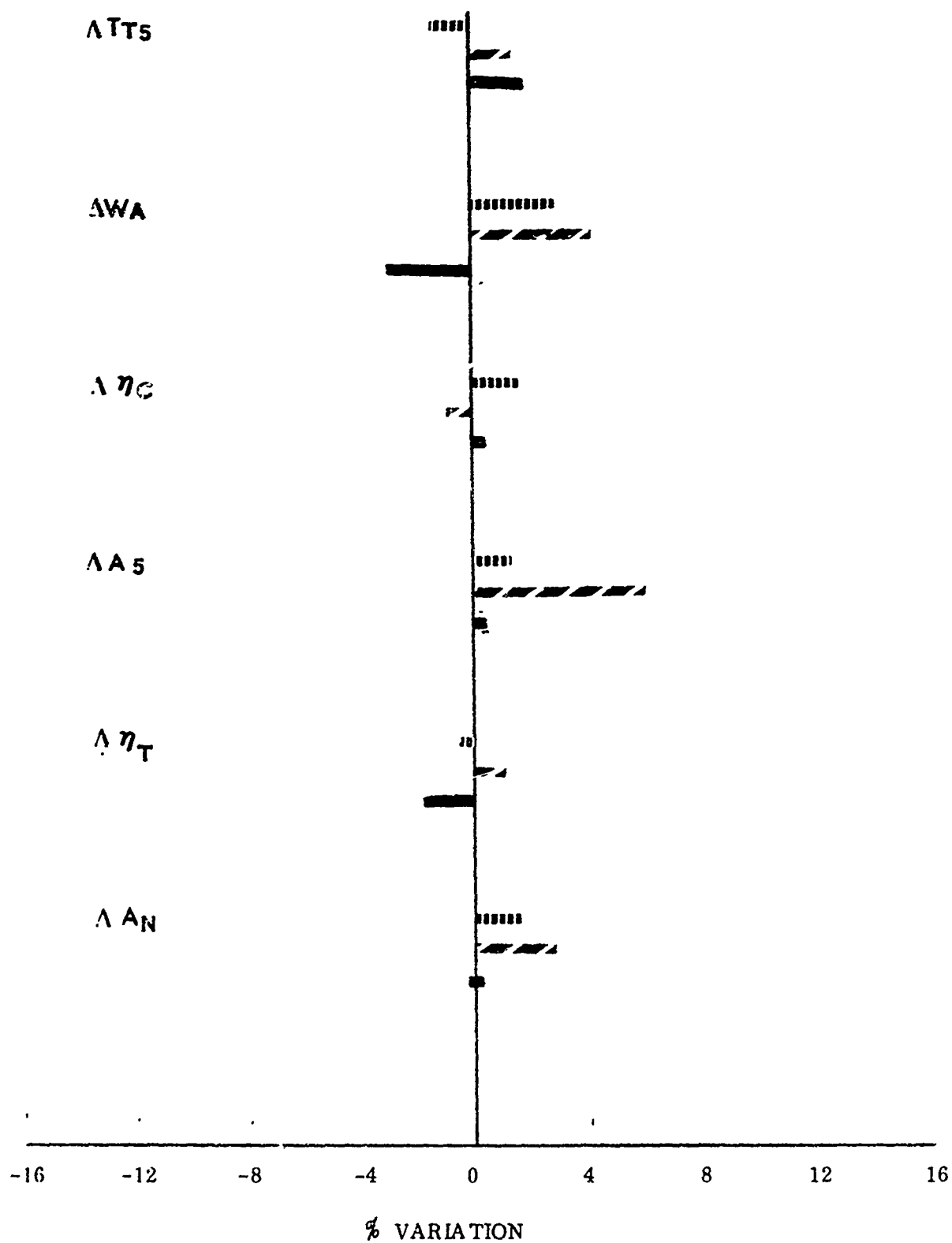


FIGURE 7-7

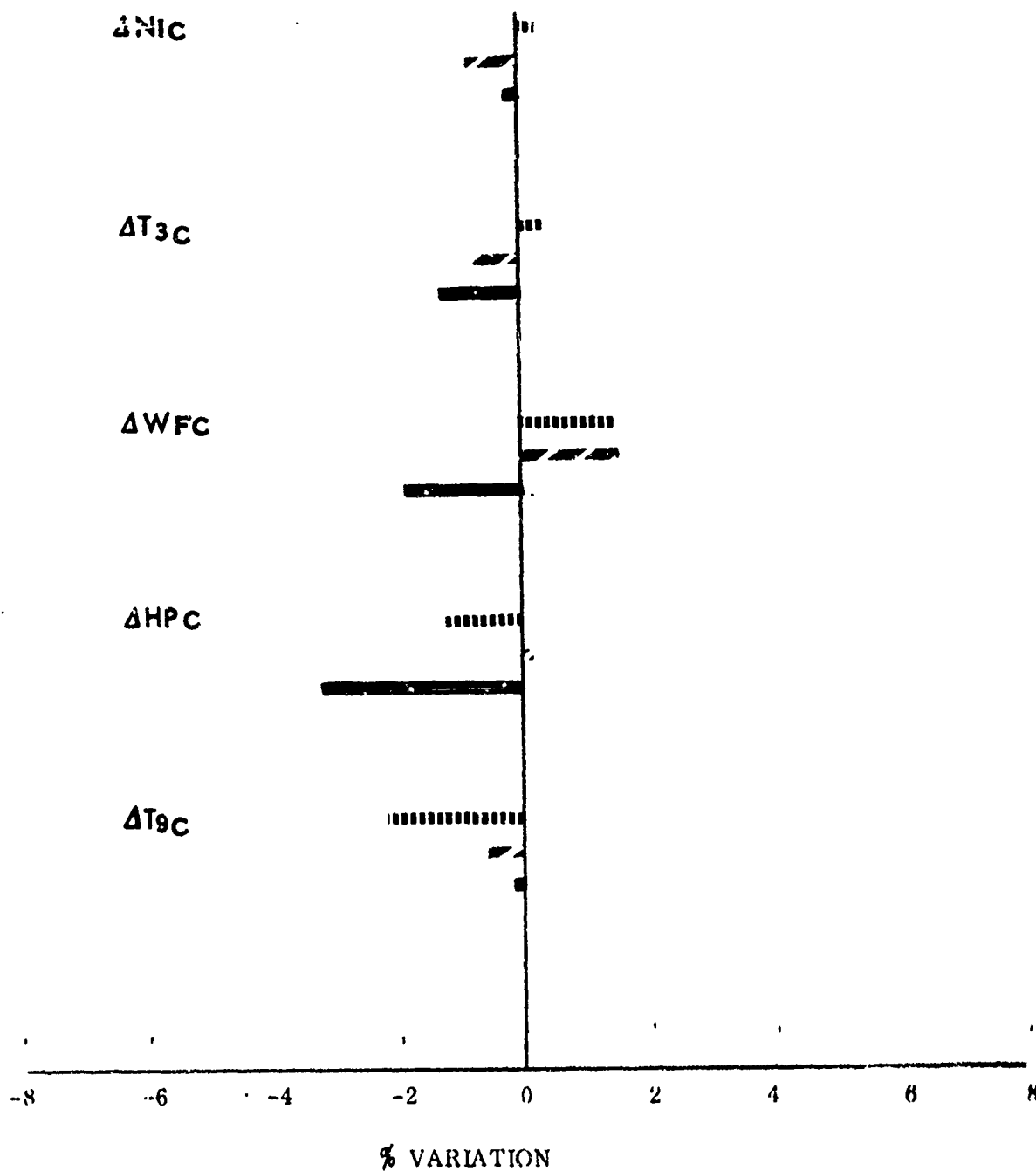


FIGURE 7-8

DATA FOR VERIFICATION ENGINE LE 18270

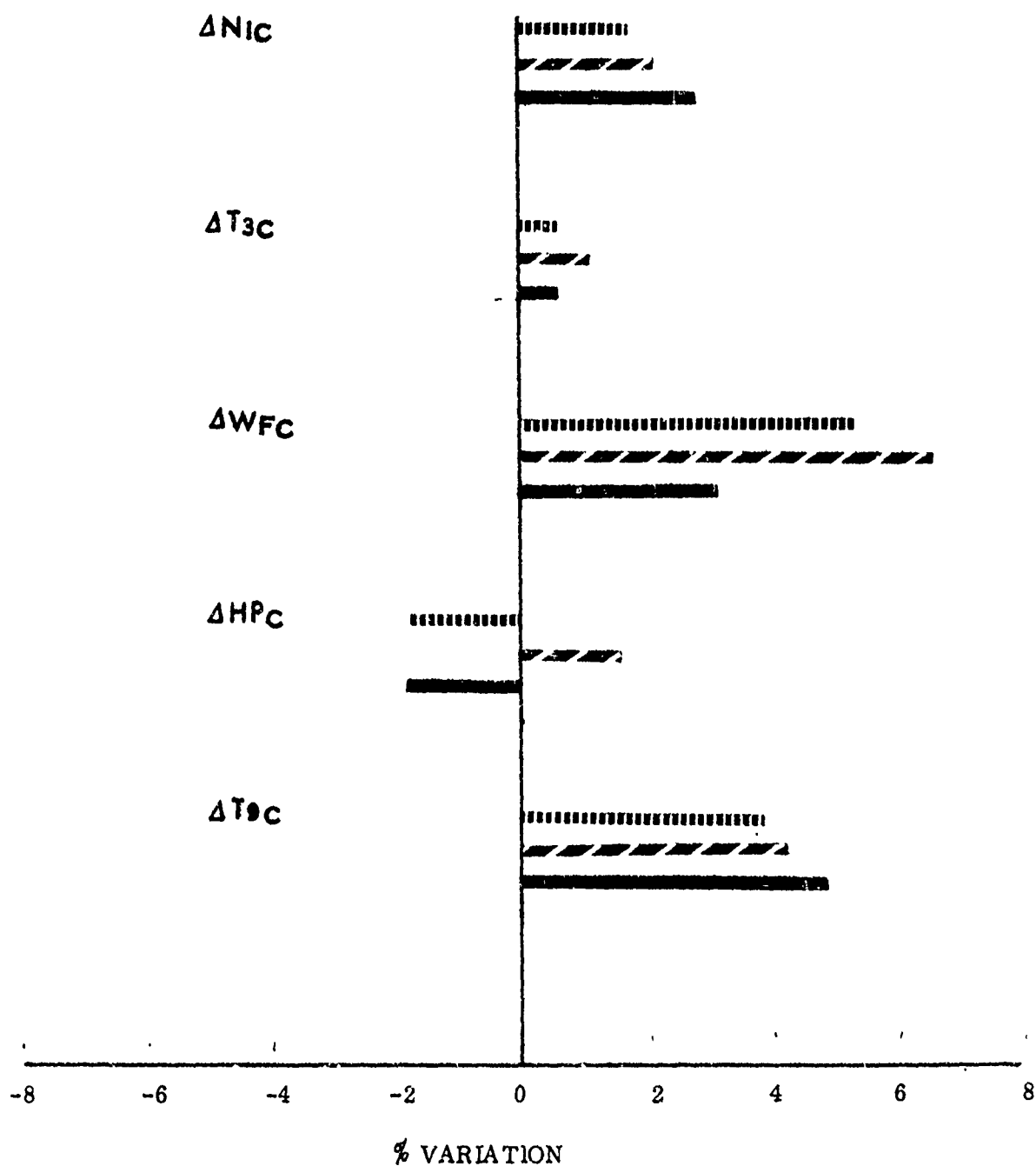


FIGURE 7-9

DATA FOR VERIFICATION ENGINE LE 20791



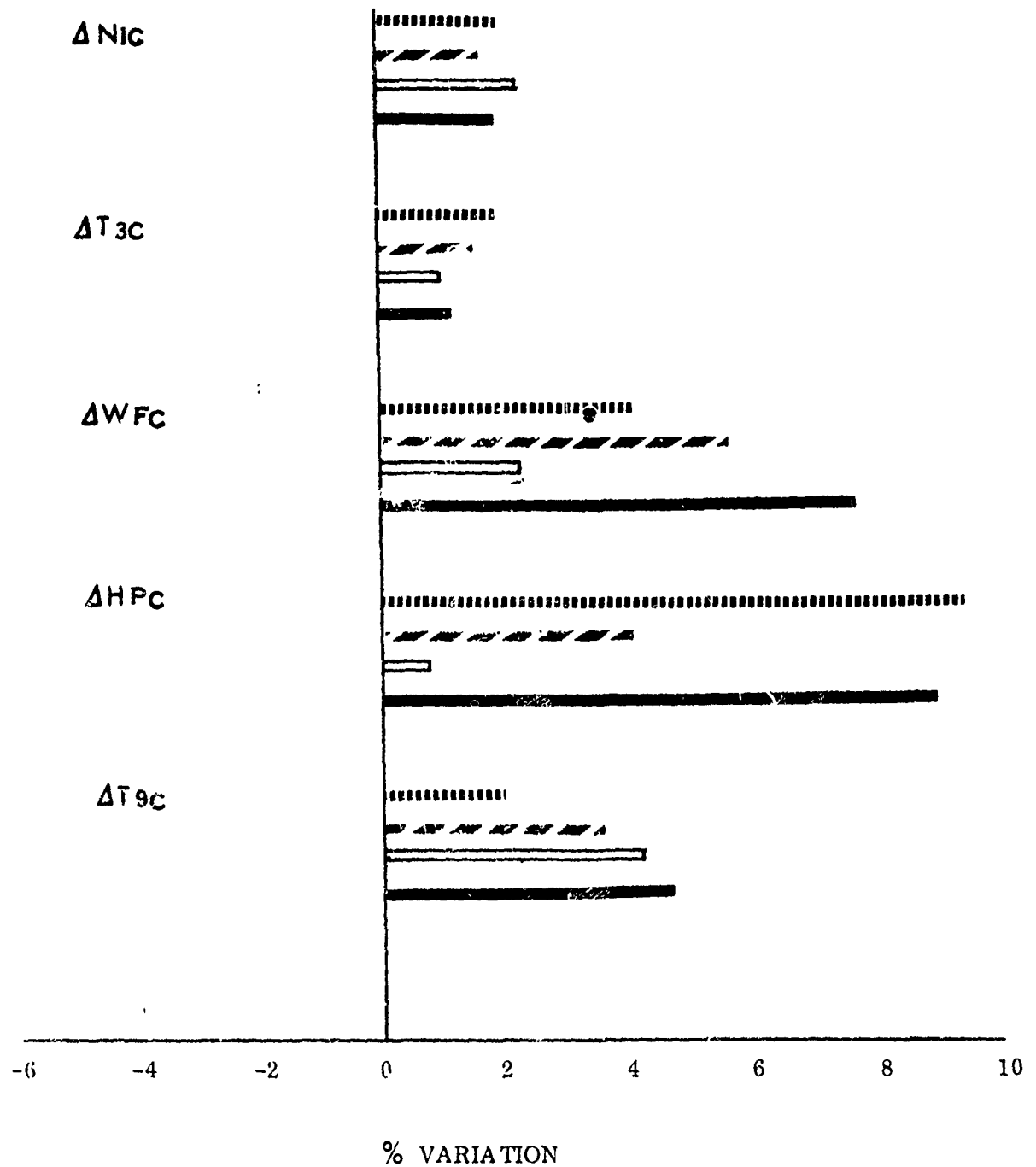


FIGURE 7-10

DATA FOR VERIFICATION ENGINE LE 14819

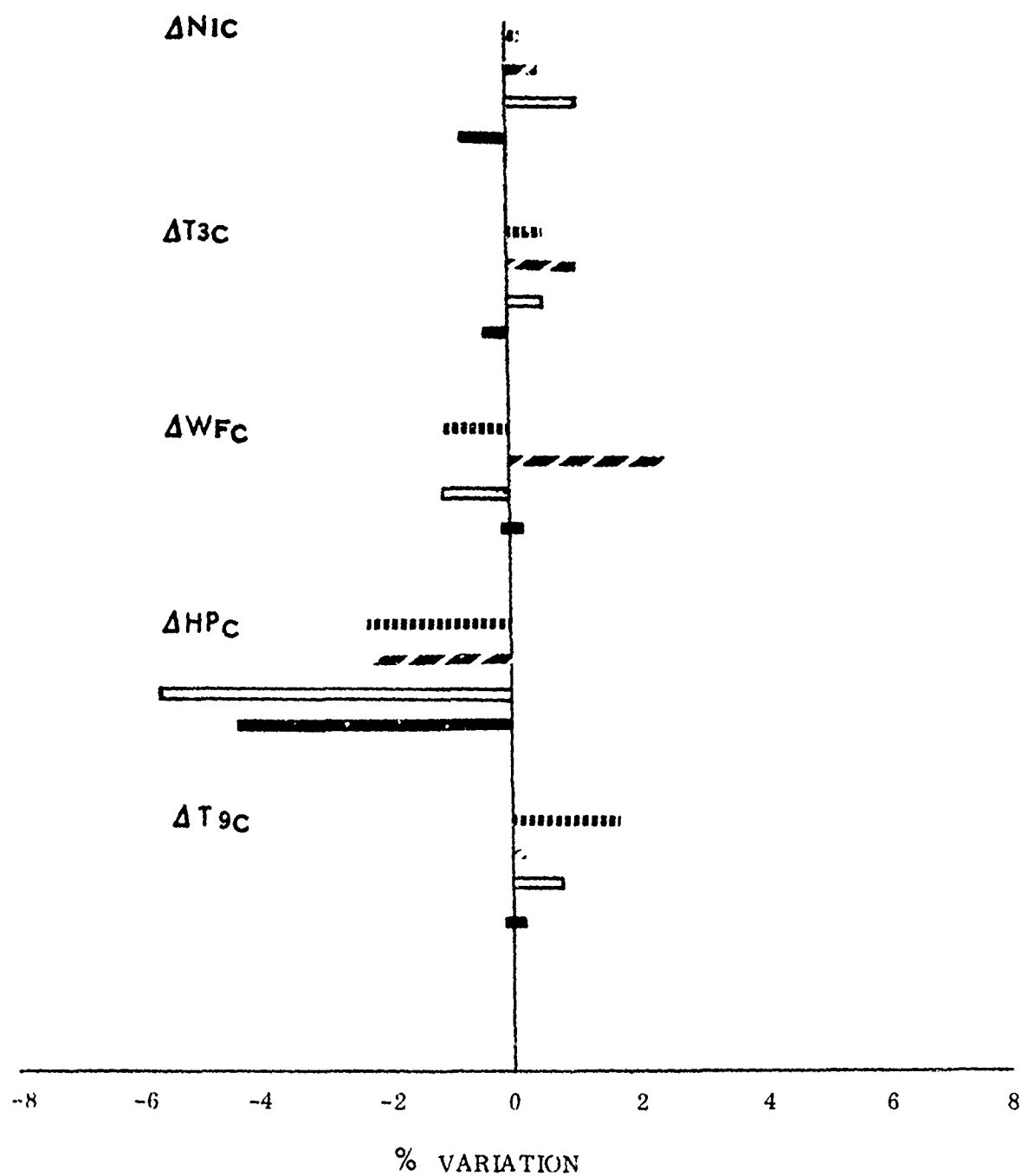


FIGURE 7-11

DATA FOR VERIFICATION ENGINE LE 17376

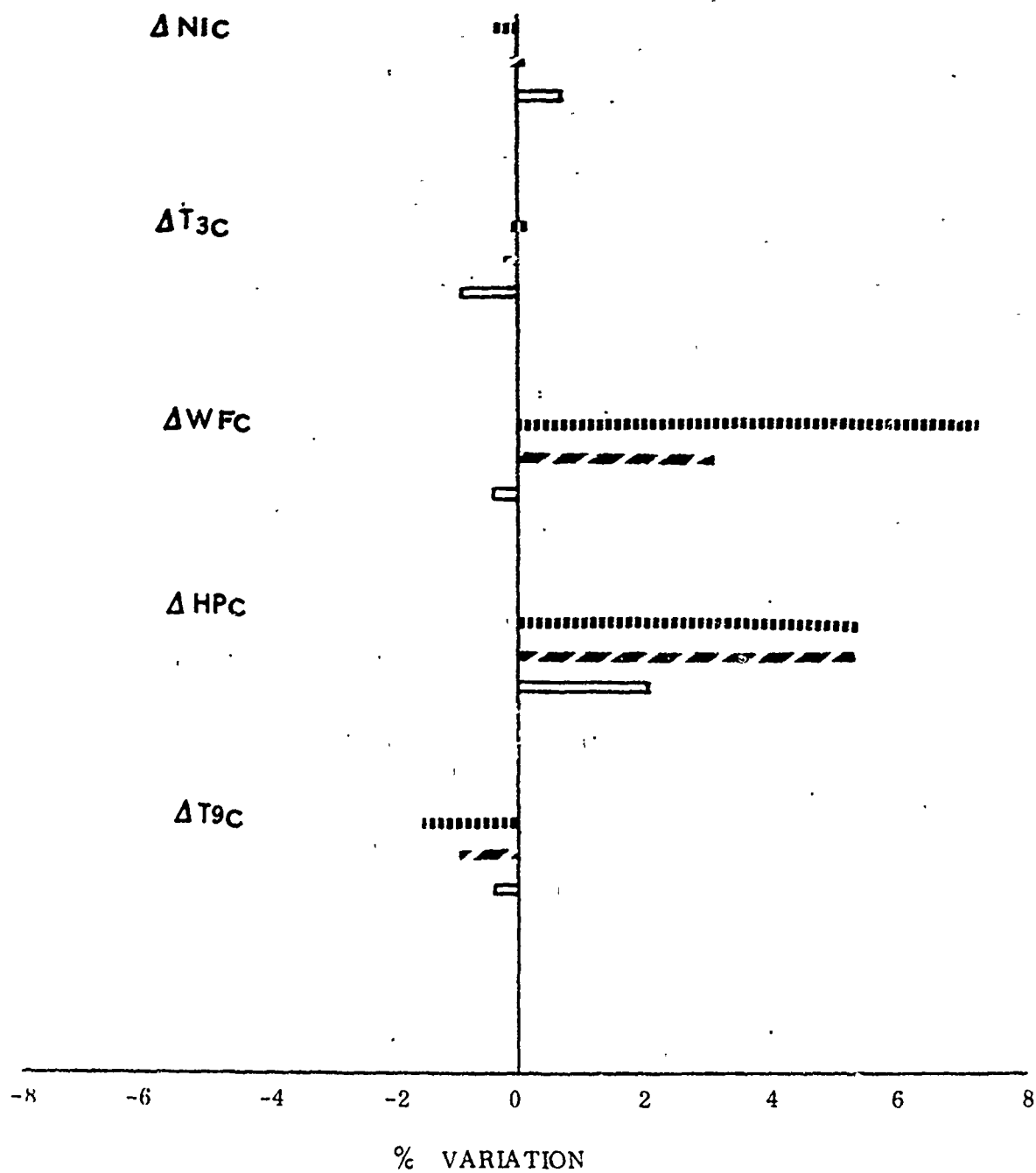


FIGURE 7-12

DATA FOR VERIFICATION ENGINE LE 18301

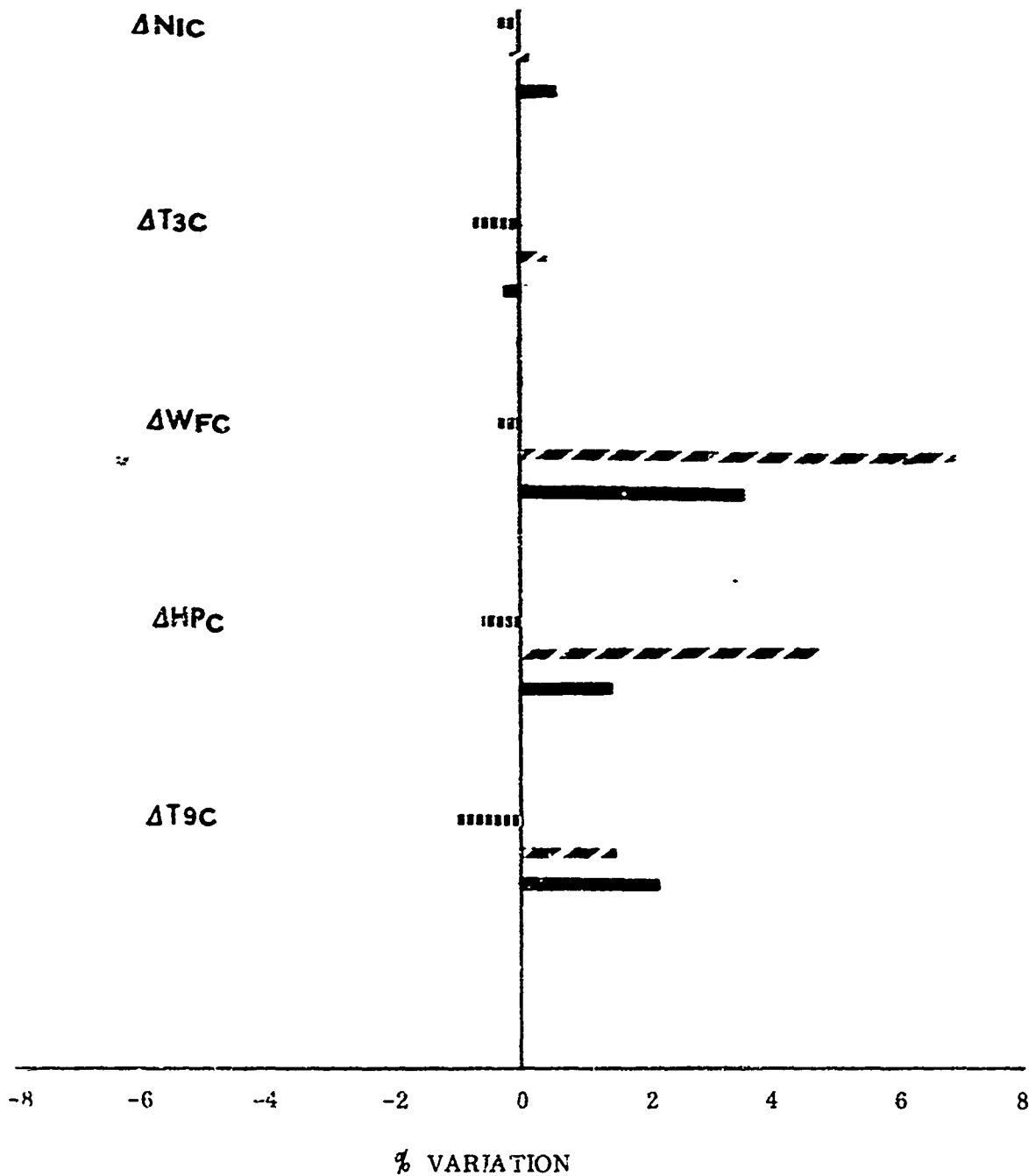


FIGURE 7-13

DATA FOR VERIFICATION ENGINE LE 16886

SECTION 8

CONCLUSIONS

SECTION 9  
RECOMMENDATIONS

**SECTION 10**  
**PHASE E PROGRAM**

Data Item	Freq. - Hz	Amplitude A One Per Rev.
<u>Main Rotor</u>		
1. Pilot's Seat Vertical Acceleration	5.2 - 5.6	.01 - 0.5 g
2. Pilot's Seat Lateral Acceleration	5.2 - 5.6	.01 - 0.5 g
3. Center of Gravity Vertical Acceleration	5.2 - 5.6	.01 - 0.5 g
4. Pylon Lateral Motion	5.2 - 5.6	.004 - 0.2 in.
5. Pylon Fore & Aft Motion	5.2 - 5.6	.004 - 0.2 in.
6. Lift Link Load - Tension	5.2 - 5.6	10 - 500 lb.
7. Main Rotor Azimuth	5.2 - 5.6	0 - 360 deg.
<u>Tail Rotor</u>		
1. 90-degree Tail Rotor Gearbox Vertical Acceleration	26.6 - 28.6	.02 - 1.0 g
2. 90-degree Tail Rotor Gearbox Lateral Acceleration	26.6 - 28.6	.02 - 1.0 g
3. Tail Rotor Azimuth	26.6 - 28.6	0 - 360 deg.

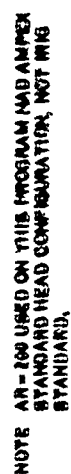
FIGURE 10-1 ROTOR MONITORING PARAMETERS



TAPE TRACK	PARAMETER	SIGNAL CONDITIONS	AMPLIFIER	TYPE	TRANSFORMER R/N	FS QTY, MIN X 1	AMPLIFIER ATTENUATION REPTIM	PULL SCALE QTY, AT MIN BIKWH	TRANSDUCER SENSITIVITY
1	(Accelerometer) Center of Gravity	Accel, 5.4 Hz G/N #1	DC	Kistler 303B	5950	.0333	5	.165 PK=0.14	303 PK mv/pk
2	(Velocity) XOP, Box Vertical	Ac el, 27 Hz G/N #1	DC	MM-11	3065	.101"/sec,	20	200 IPS	20 mv/in./sec,
3	(Displacement) Pylon Motion Internal	Motion 5.4 Hz G/N #1	DC	Hewlett- Packard 24, DCUT	"K"	.003112"	5	.01707" PK	11.72 volts/inch
4	(Velocity) XOP G. Box Internal	Accel, 27 Hz G/N #2	DC	MM-11	3060	.101"/sec,	20	2.00 IPS	20 mv/in./sec,
5	(Displacement) Pylon Motion Fore & Aft	Motion 5.4 Hz G/N #2	DC	Hewlett- Packard 24, DCUT	"Y"	.003115"	5	.01725" PK	15.72 volts/inch
6	- -	- -	- -	- -	- -	- -	- -	- -	- -
7	(Acceleration) Pilot's Seat Vertical	Accel, 5.4 Hz G/N #2	DC	Kistler 303B	9856	.03307	5	.165 PK=0.14	300 PK mv/pk
8	(Magnetic Pickup) Tail Rotc. Asimuth	- -	Clipper	Electro- Products 3030	- -	- -	- -	- -	- -
9	(Acceleration) Pilot's Seat Lateral	Accel, 5.4 Hz G/N #3	DC	Kistler 303B	4957	.0333	5	.165 PK=0.14	303 PK mv/pk
10	- -	- -	- -	- -	- -	- -	- -	- -	- -
11	(Semiconductor Strain Gauge) Lift Link	Strain Gauge 5.4 Hz G/N #1	DC	BIC Supplied	01	100	5	250	198 lbs./mv/v
12	Time Generator	-	Feed- thru	1 Hg B	- -	- -	- -	- -	- -
13	(Magnetic Pickup) Main Rotor Asimuth	- -	Clipper	Electro- Products 3030	- -	- -	- -	- -	- -

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FIGURE 10-2 SIGNAL CONDITIONING CHARACTERISTICS



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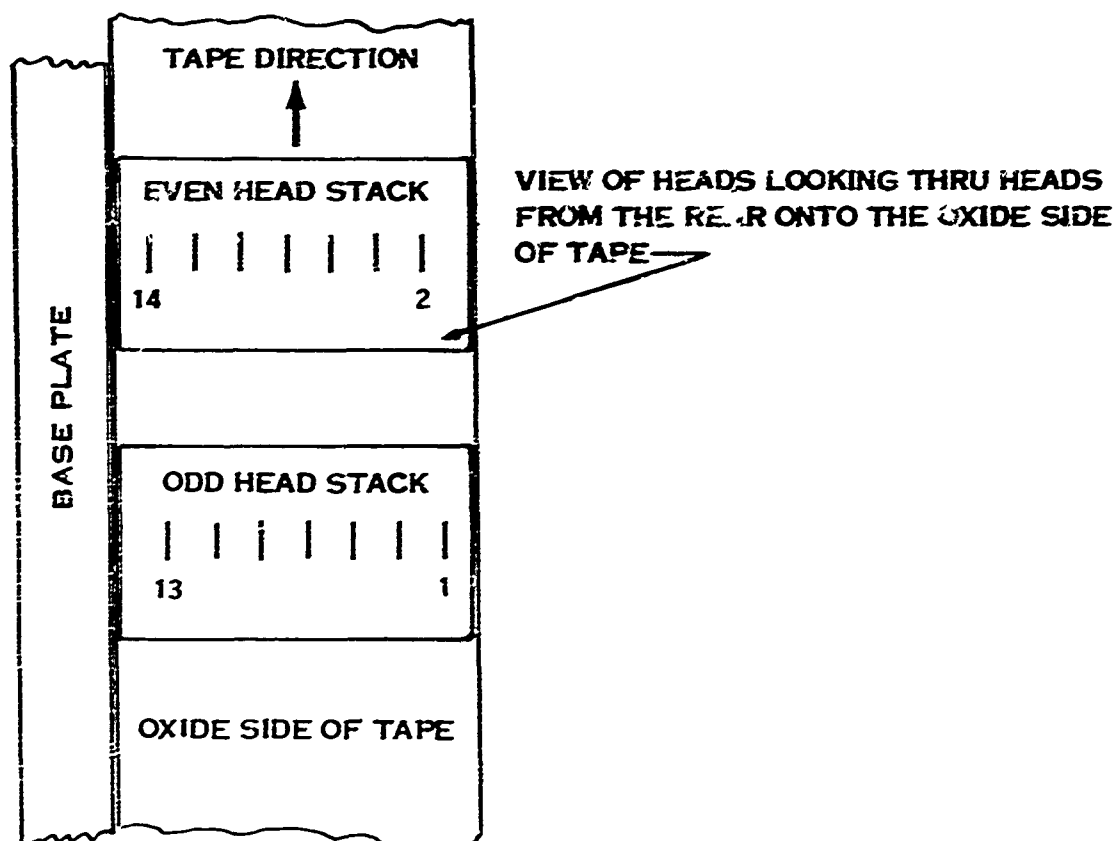


FIGURE 10-4 AMPEX "STANDARD" RECORD HEADS

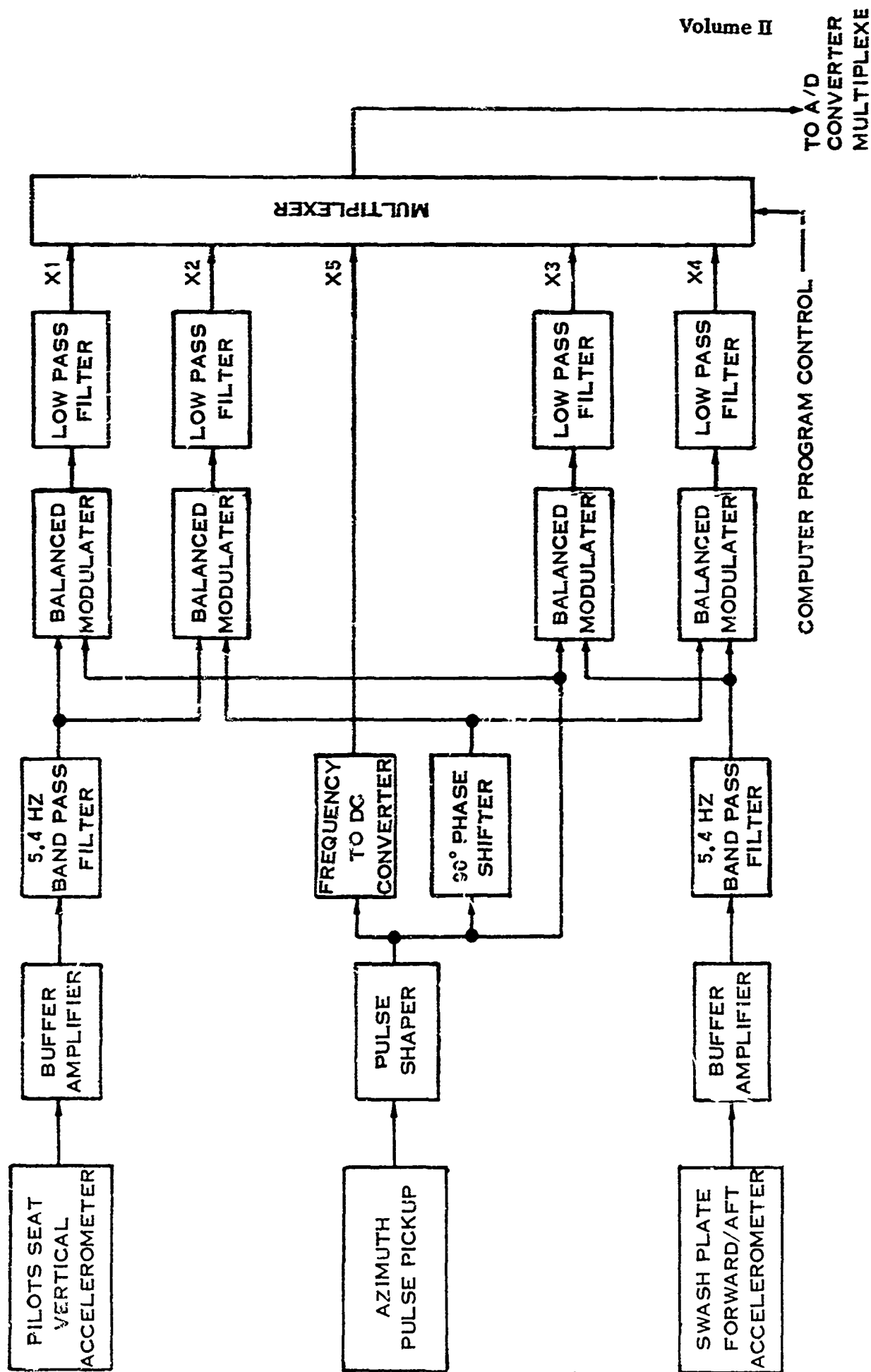


FIGURE 10-5 ROTOR UNBALANCE IMPLEMENTATION BLOCK DIAGRAM

**FIGURE 10-6 HAMILTON STANDARD COMPONENT HEALTH RESULTS FROM PHASE E WORSE  
DEGRADED PARTS FLIGHT TEST ENGINE**

FIGURE 10-7 SUMMARY OF CALCULATED PARAMETERS  
FOR AIDAPS PHASE E TESTS

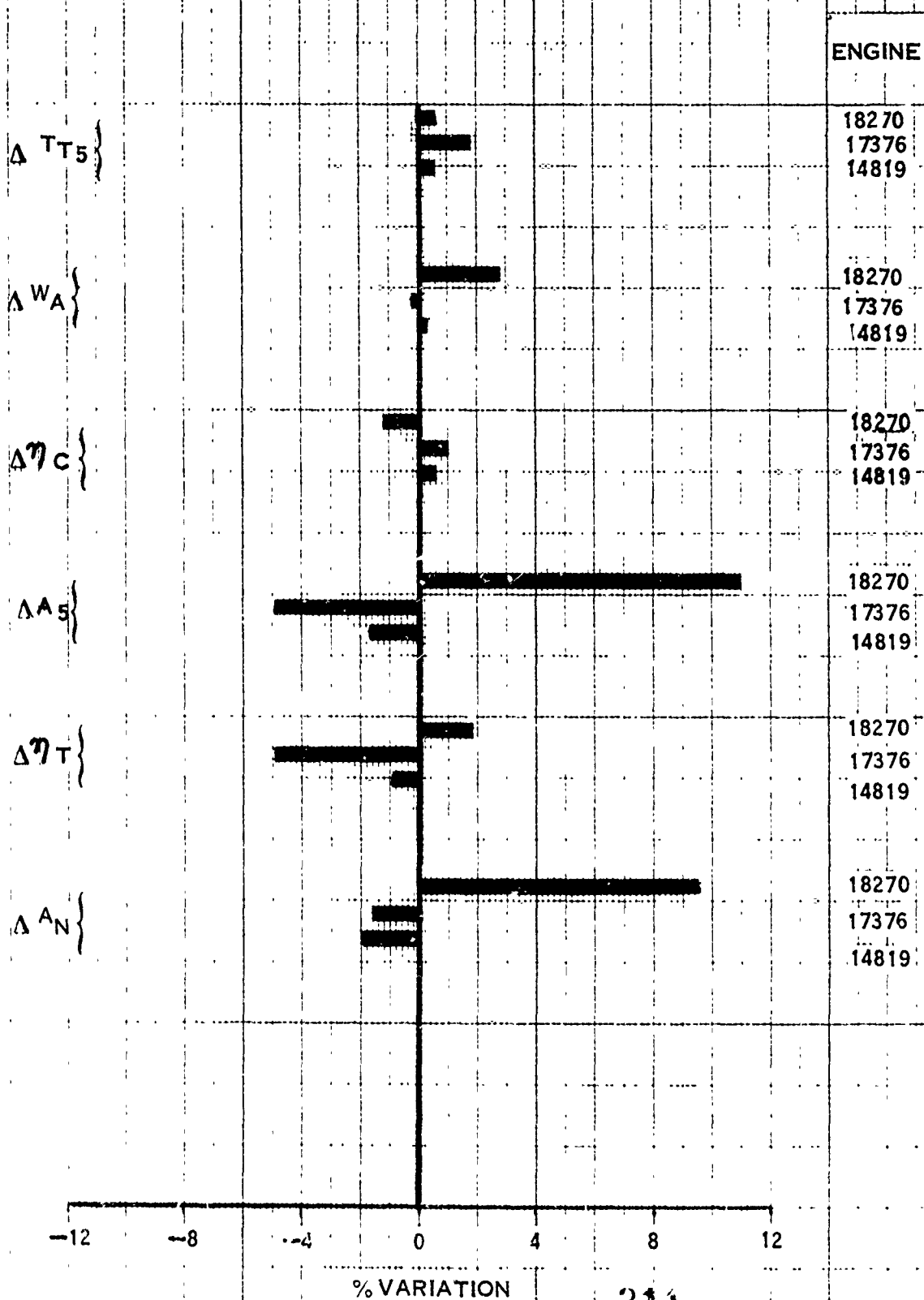


FIGURE 10-8 SUMMARY OF MEASURED PARAMETERS FOR  
AIDAPS PHSE E TESTS

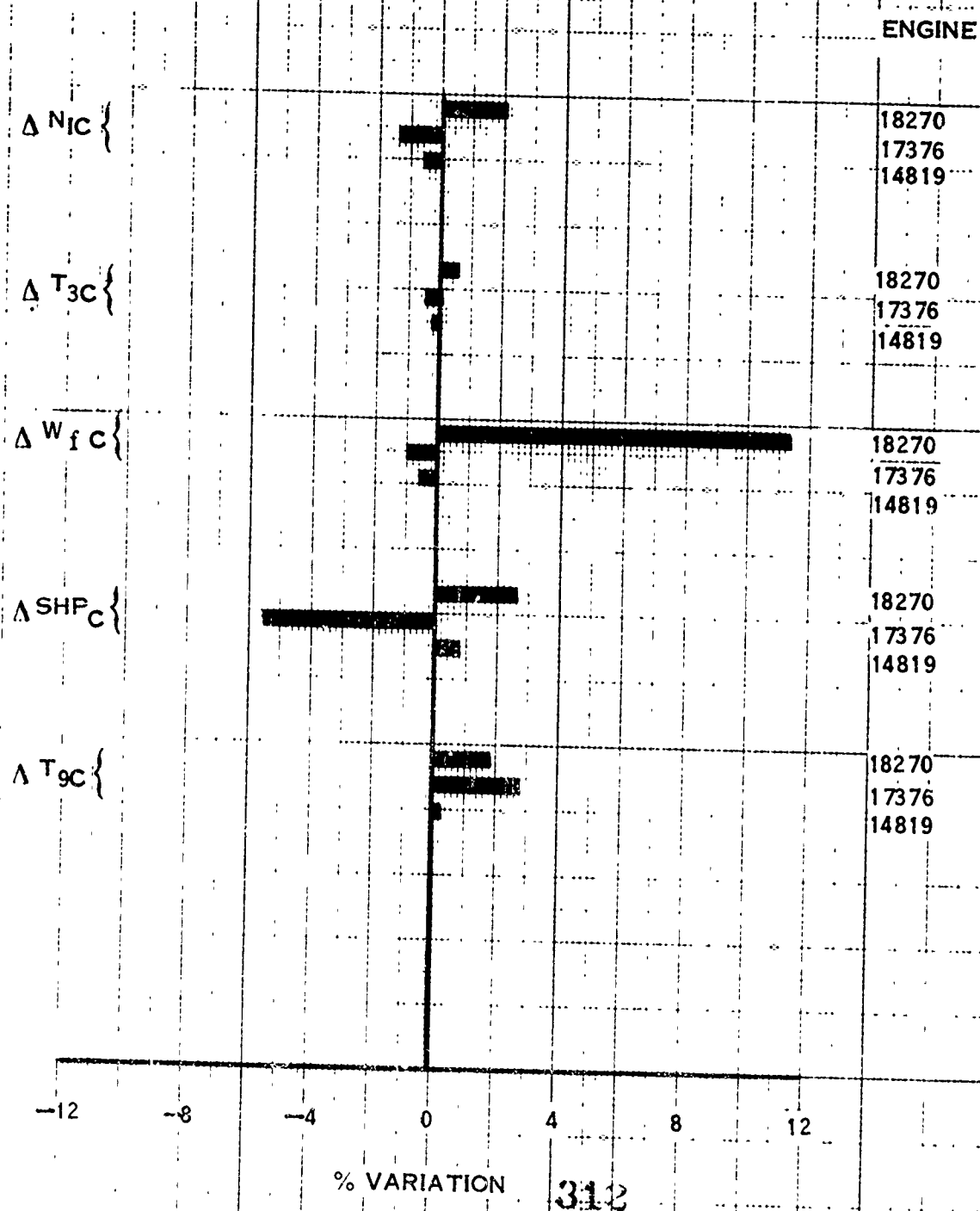


FIGURE 10-9 CALCULATED PARAMETERS FOR LE 18270

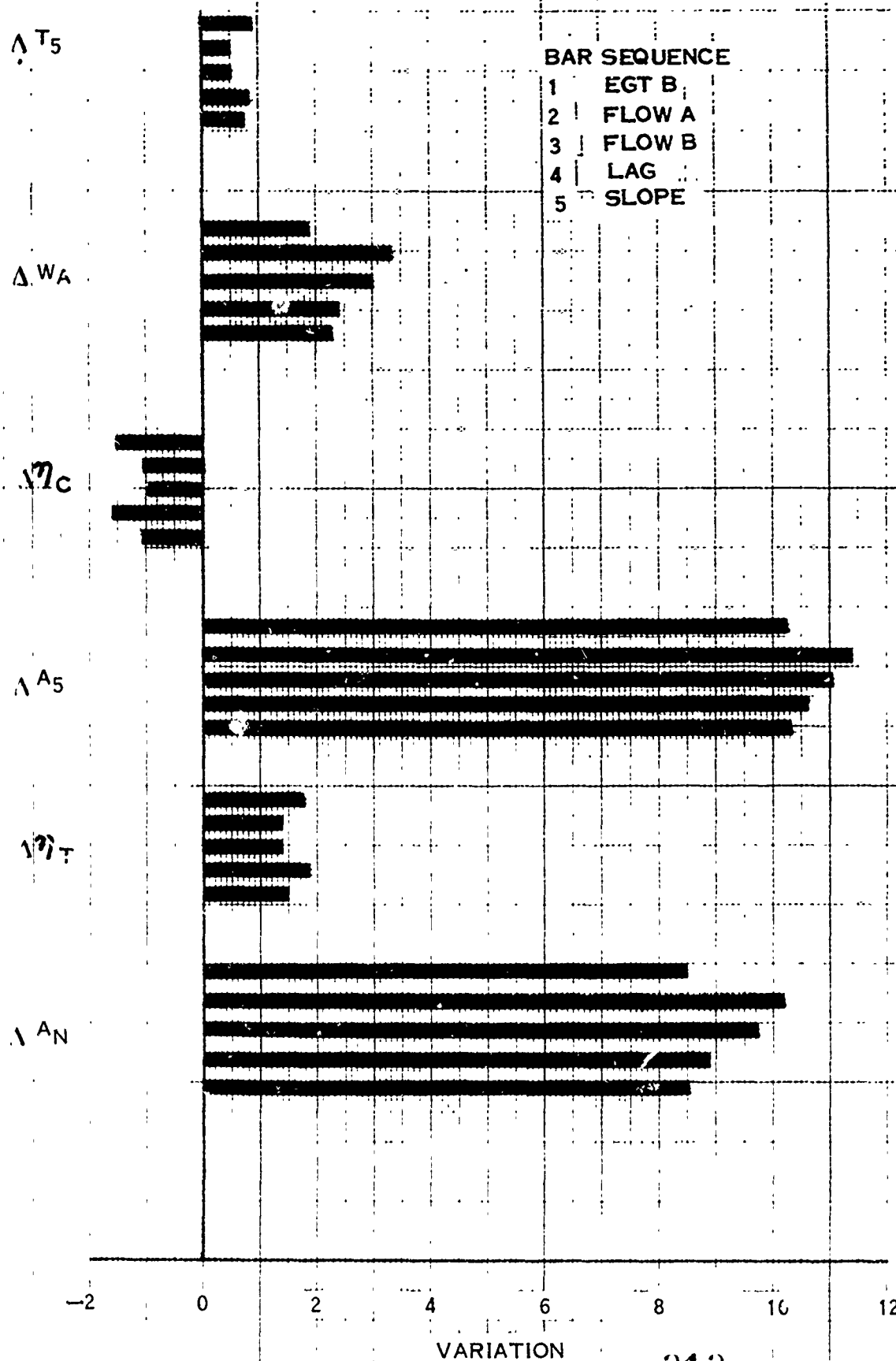




FIGURE 10-10 MEASURED PARAMETERS FOR LE 18270

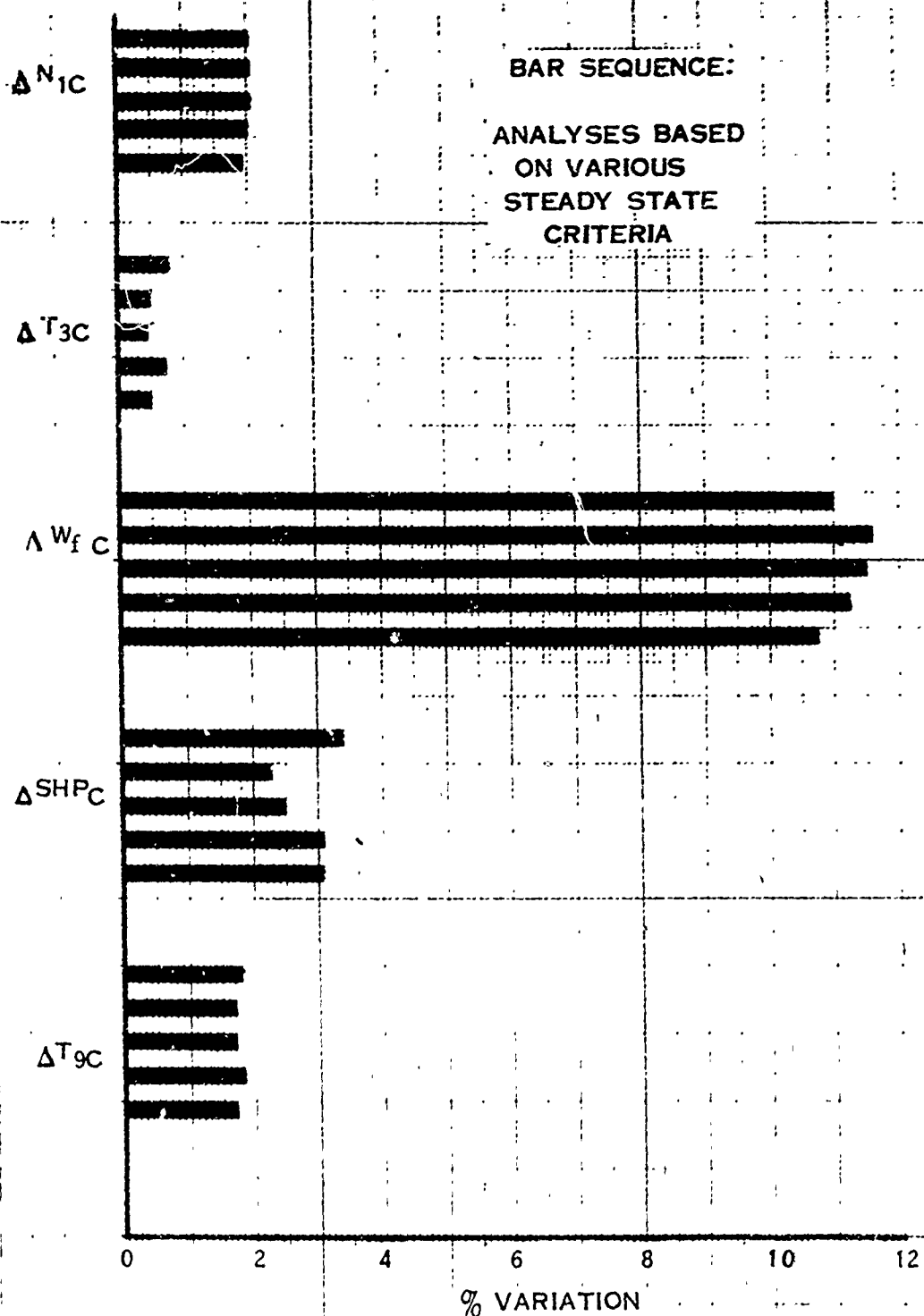


FIGURE 10-11 CALCULATED PARAMETERS FOR LE 17375

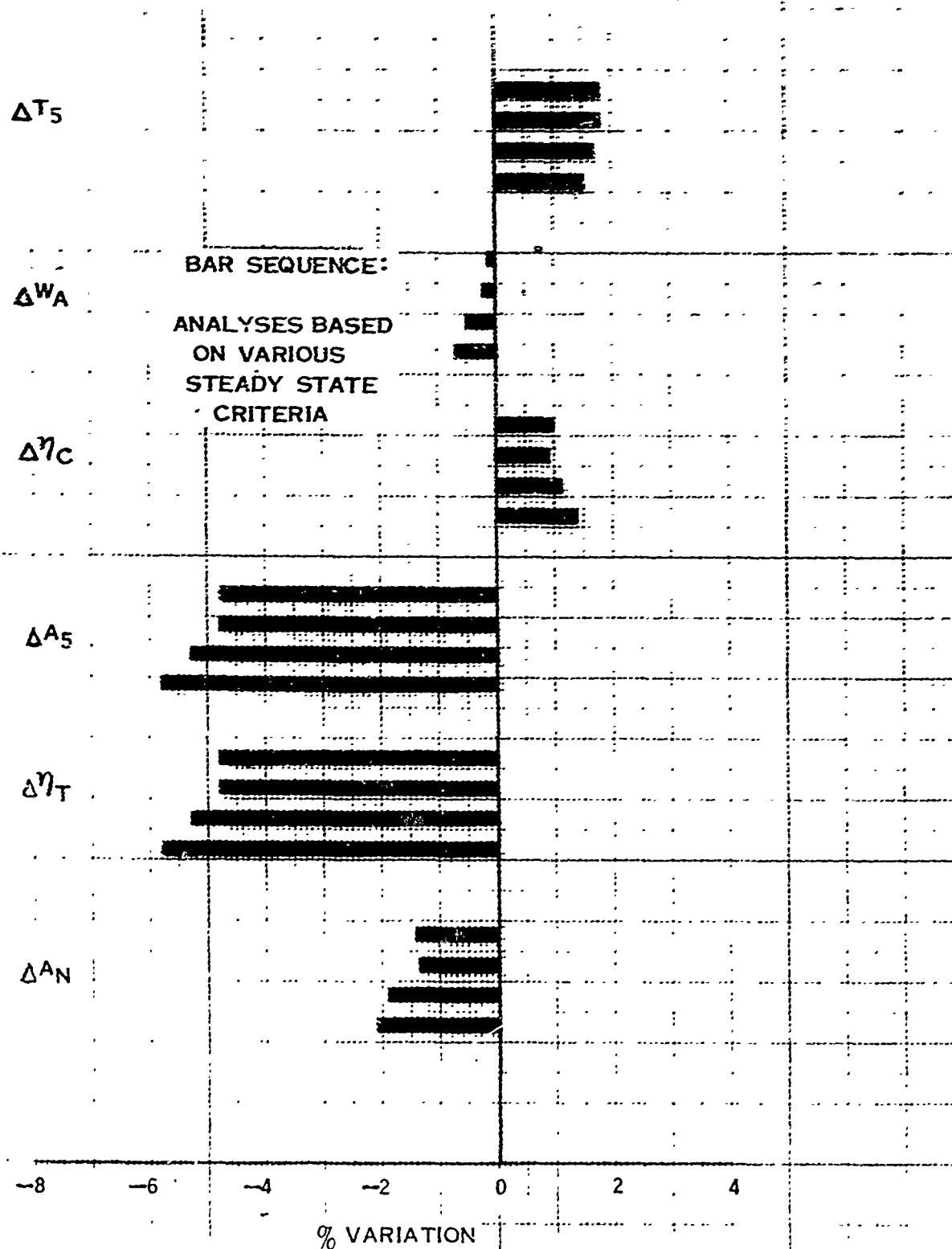


FIGURE 10-12 MEASURED PARAMETERS FOR LE 17376

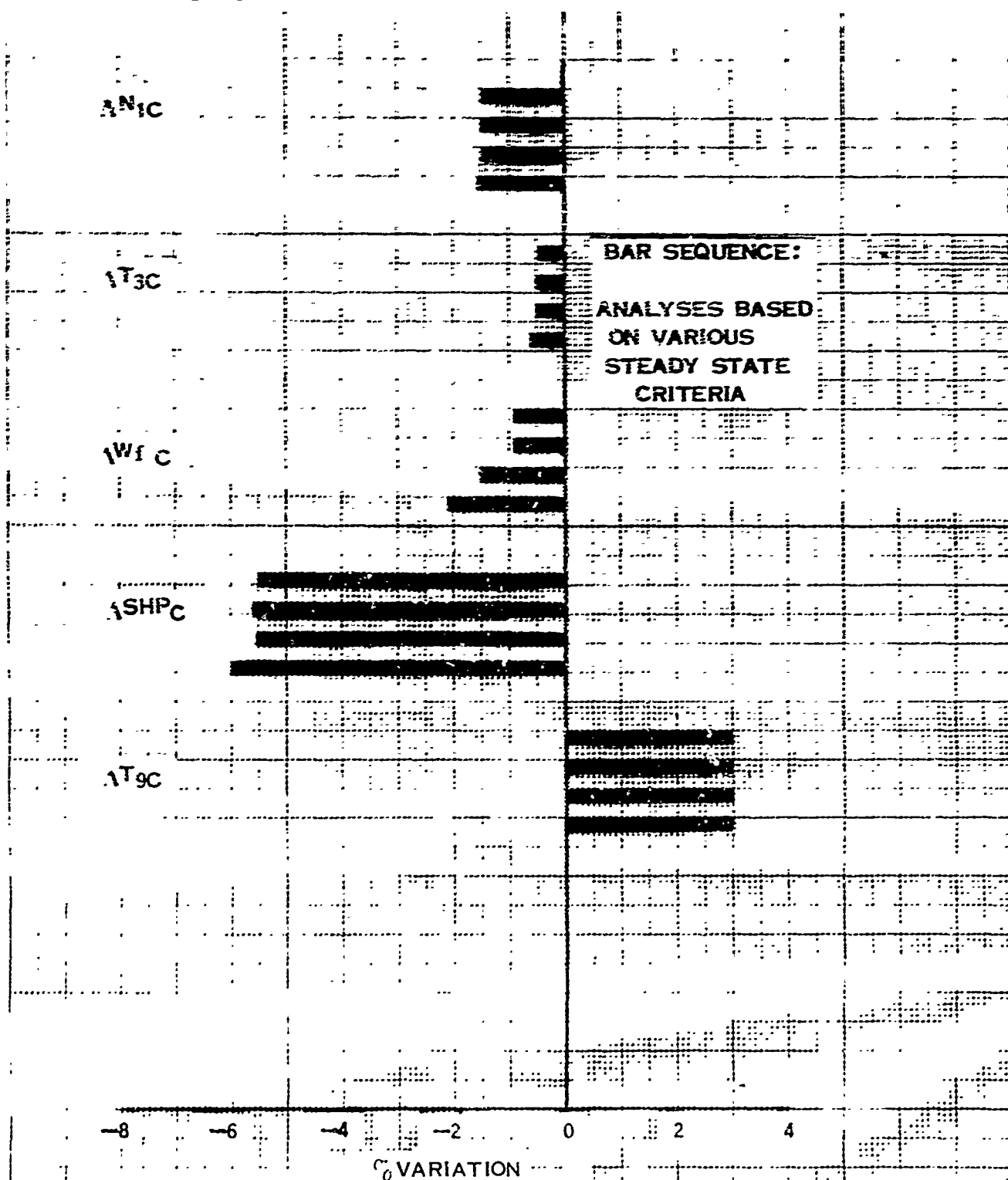


FIGURE 10-13 CALCULATED PARAMETERS FOR LE L4819

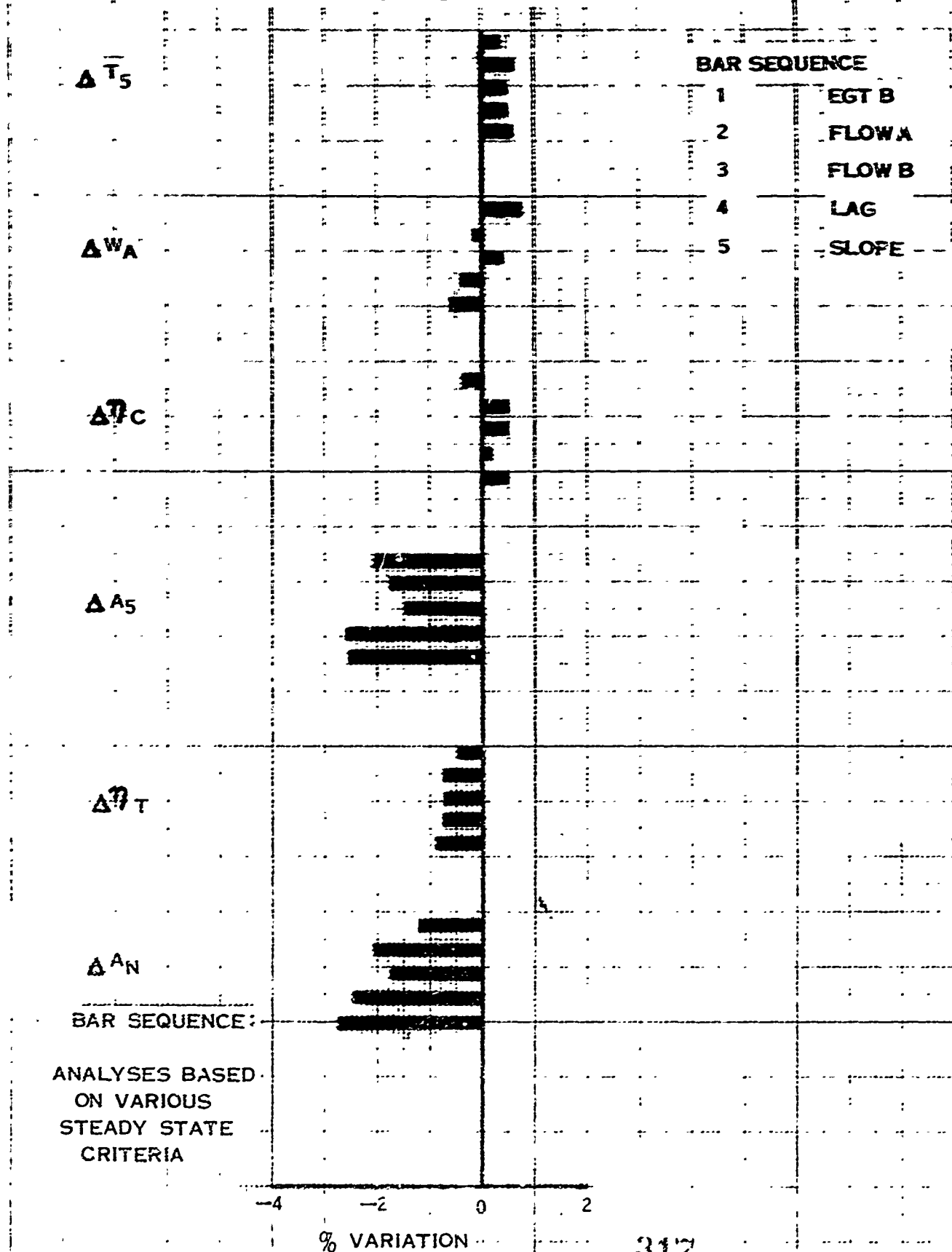


FIGURE 10-14 MEASURED PARAMETERS FOR LE 14319

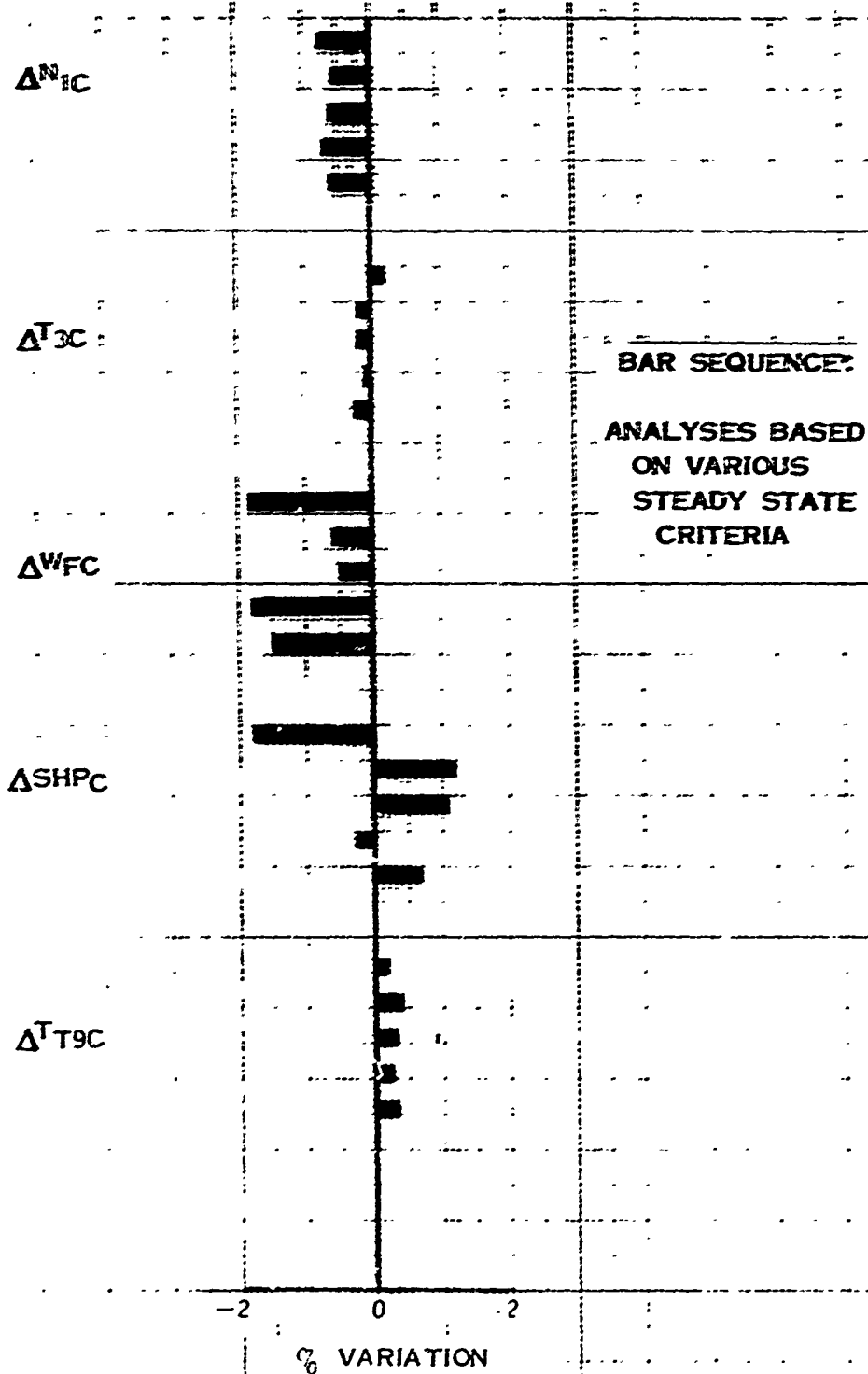
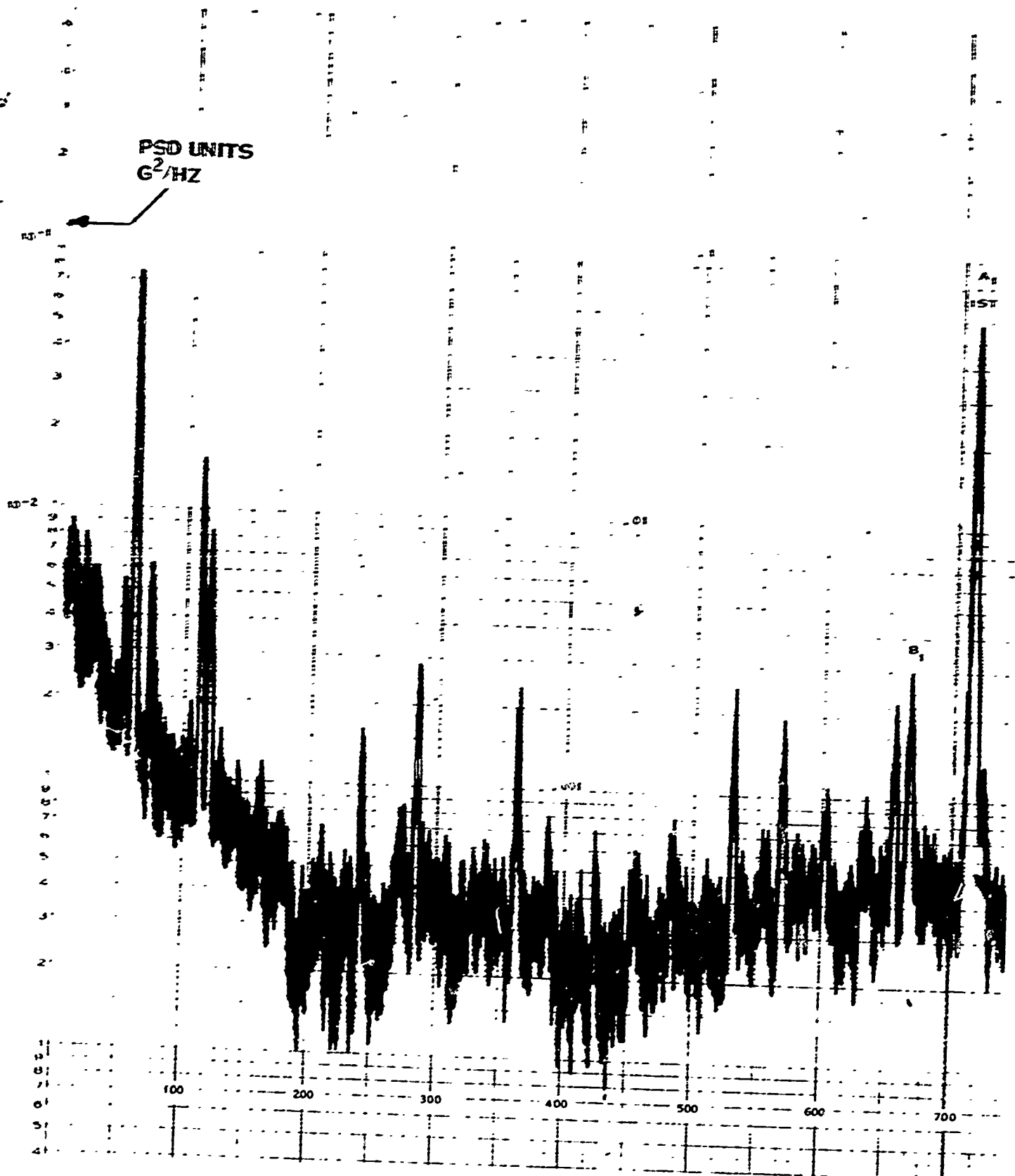


Figure 10-15

TABLE 1. VERIFICATION TEST - WIND CONDITION				TABLE 2. VERIFICATION TEST - WIND CONDITION						
Flight Number	Run Number	#4	#7	#8	#9	#12	#47	#123	#49	#136
1	205	105, 106	48, 74, 75	178, 179, 252, 253, 262, 263, 264, 342	77, 103, 104, 105, 209, 239, 240, 287, 288, 312, 313, 335, 336	77, 78, 287, 288	104, 105, 208, 209	105, 209, 240	97-100, 103, 105, 112, 143, 162, 208-210, 247	274
2	207	44, 45, 47	0	0	90, 91, 97, 98, 100, 101, 105, 191, 203, 237-240, 246, 285, 286, 312-317, 320-339, 342	191, 285, 286, 333	104, 105, 207, 208	105, 238	97-100, 103, 105, 112, 143, 207-209, 312	143
3	209	44, 47, 710	210	177-179, 204, 222	16, 94-96, 98, 102, 103, 141-143, 180, 191, 231, 239-240, 284, 285, 312-314, 317, 321-325, 327-333, 336, 338-341	94-96, 141-143, 180-191, 331, 336-238, 281-285, 287	--	5-7, 14, 103, 34-37, 102, 205	97-100, 102, 103, 112, 117, 122, 124-128, 143, 205, 208, 237, 238	117, 122, 127, 132, 135, 142, 146, 147
4	211	0	0	180, 181, 319	48, 49, 90, 94-98, 101-105, 192, 237-244, 285, 287-289, 312, 314, 315, 323, 335, 336, 338	77, 79-98, 144, 145, 192, 239-241, 284-291, 335, 336	--	6, 13, 14, 31-38, 49, 50, 104, 105, 240	96-100, 105, 112, 143, 144, 207-209, 239, 240	55, 116, 117, 143
5	213	1	0	182	40, 41, 94-98, 103, 105, 209, 313	218	2, 104, 105, 208, 209, 313	105	97-100, 103, 105, 112, 143, 144, 208-210, 162, 240	55, 116, 123, 142, 143, 250
6	215	44, 45	0	180, 181, 226	66, 77, 78, 105, 313	28, 77, 78	104, 105, 208, 209, 313	28, 105	97-100, 105, 112, 129, 130, 143, 144, 208, 209, 247	98, 143
7	217	0	0	181, 182	34, 40-43, 98-101, 103, 105, 210, 313, 314	272	104, 105, 210, 314	105	97-100, 103, 105, 125, 130, 112, 143-145, 209-211	117, 140, 253, 268
8	219	44, 45	0	181, 182, 321	40-43, 66, 99-98, 103, 210, 315, 316	0	105, 210	196, 316	97-100, 105, 130, 143, 144, 210, 211	116, 274

#129	#79	#61	#64	#66
71, 104, 105, 207, 311, 312, 313	0	33, 44, 77, 101, 108, 329, 330	341, 348	- -
73, 104, 105, 207, 311-313	0	33, 44, 210, 214	97, 319	- -
2, 43-45, 101, 146, 157, 160-163, 166, 177, 178, 179-200, 266, 287, 301, 302, 308-309	17, 18, 22-24, 27-30, 33, 34, 51, 60, 61, 64-67, 73, 76, 181	31, 32, 43, 44, 48, 38, 78, 83, 88, 89, 98, 97, 108, 118, 121, 144, 145, 147, 148, 153, 154, 169, 170, 216, 231	95, 96, 161-164, 166-168, 170, 171, 175-178, 190-192, 174-227, 229, 230, 239, 283-285	- -
44, 104, 105, 146, 148, 149, 159, 160, 171, 178, 229, 287, 288, 289, 290, 301, 310	96, 97	18, 30, 33, 44, 97, 127, 188, 137, 138, 140, 147, 151, 158, 243, 254, 259	150, 157, 159, 169, 171, 319, 173-176, 192-194, 196, 200, 201-203, 205, 207, 210-213, 220-222, 224-227, 230, 240, 274-278, 282-284, 287, 291, 296, 297, 309	- -
104, 105, 209, 312, 313	97-97	31-33, 36-39, 41-43, 88, 97, 127-129, 137, 138, 146, 151, 158, 243, 254, 259, 260	96, 157, 159, 169, 203, 173-176, 192, 193, 202, 211-213, 215-217, 219, 220-222, 224-227, 231, 280-283, 291, 309, 308, 310	- -
105, 209, 312, 313	69, 97-97, 120, 239-241	30, 32-34, 37, 38, 41-44, 67, 72, 73, 96, 97, 100, 121, 143-145, 168, 169, 215, 216	95-97, 159-161, 169, 170, 174-176, 192-194, 202, 203, 207-227, 230, 240, 241, 283, 285	- -
71, 71, 104, 105, 210, 217, 311, 314	97, 209, 314	32, 33, 38, 41-44, 97, 102, 259, 263	98, 161, 162, 174-176, 313, 314, 334, 342	- -
72, 71, 104, 210, 211, 319-317	97-98, 209	31-34, 36-38, 41-44, 53, 73, 96, 106	97, 318	- -

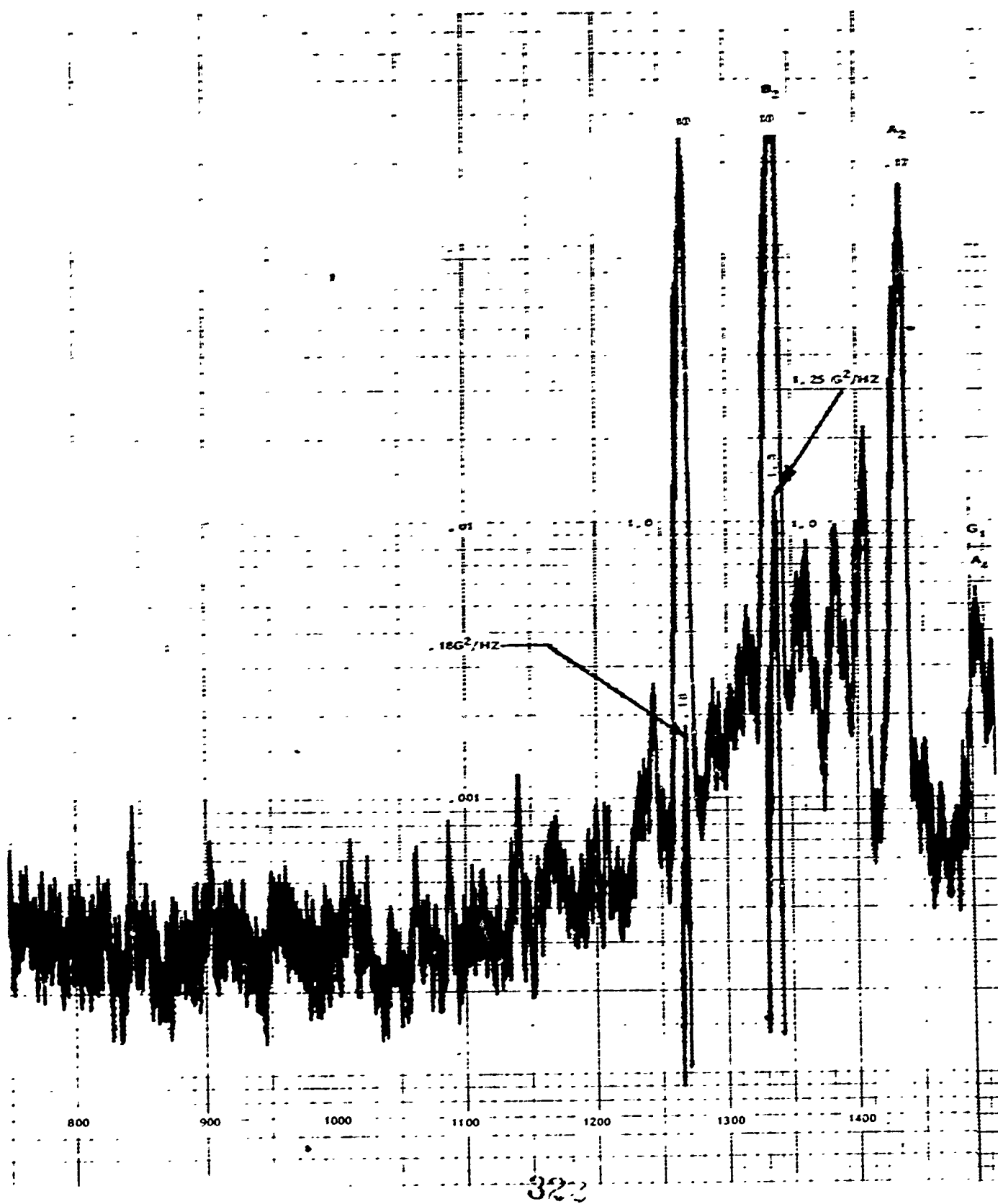
Fig 10-15 A

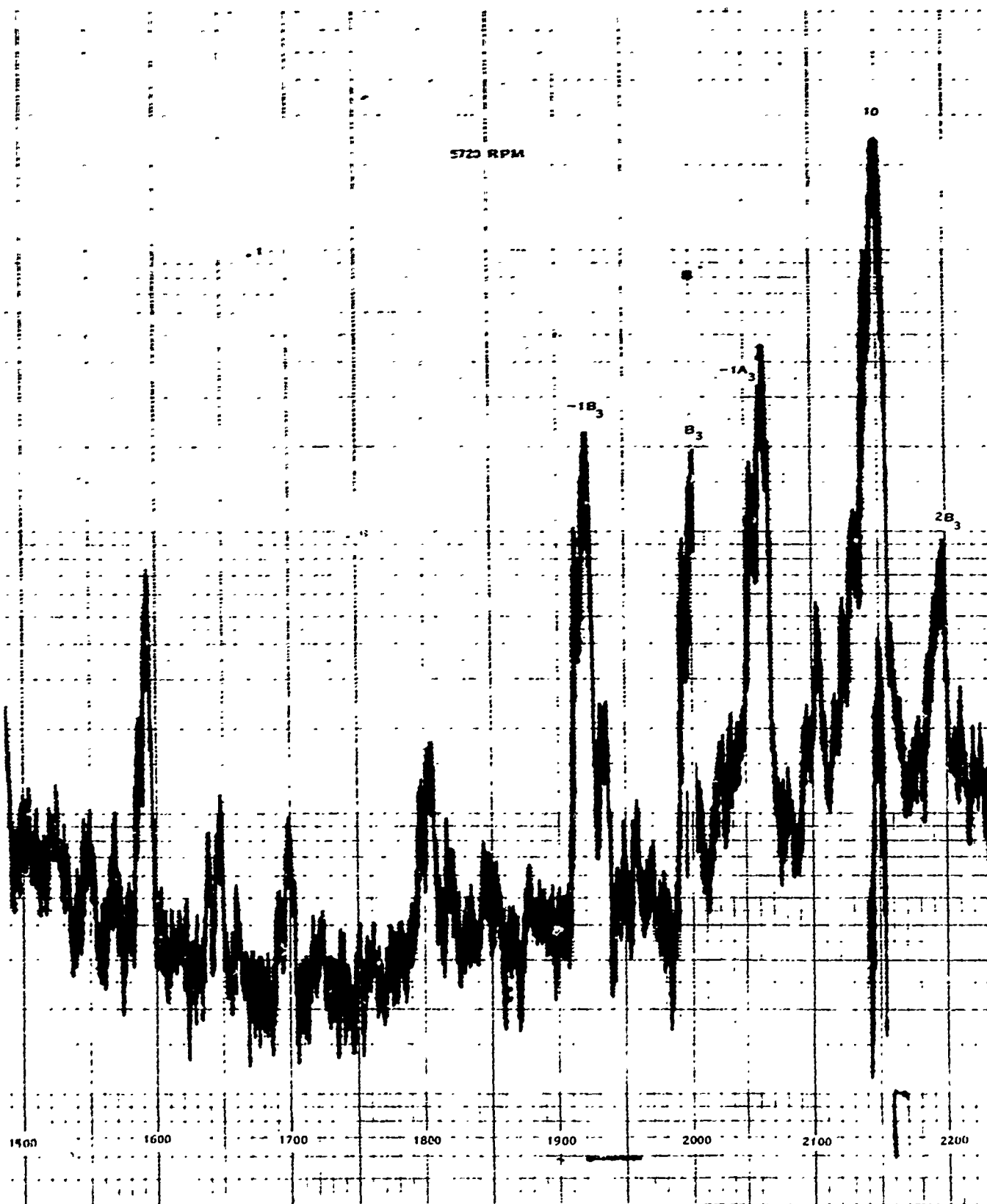


16 A

321

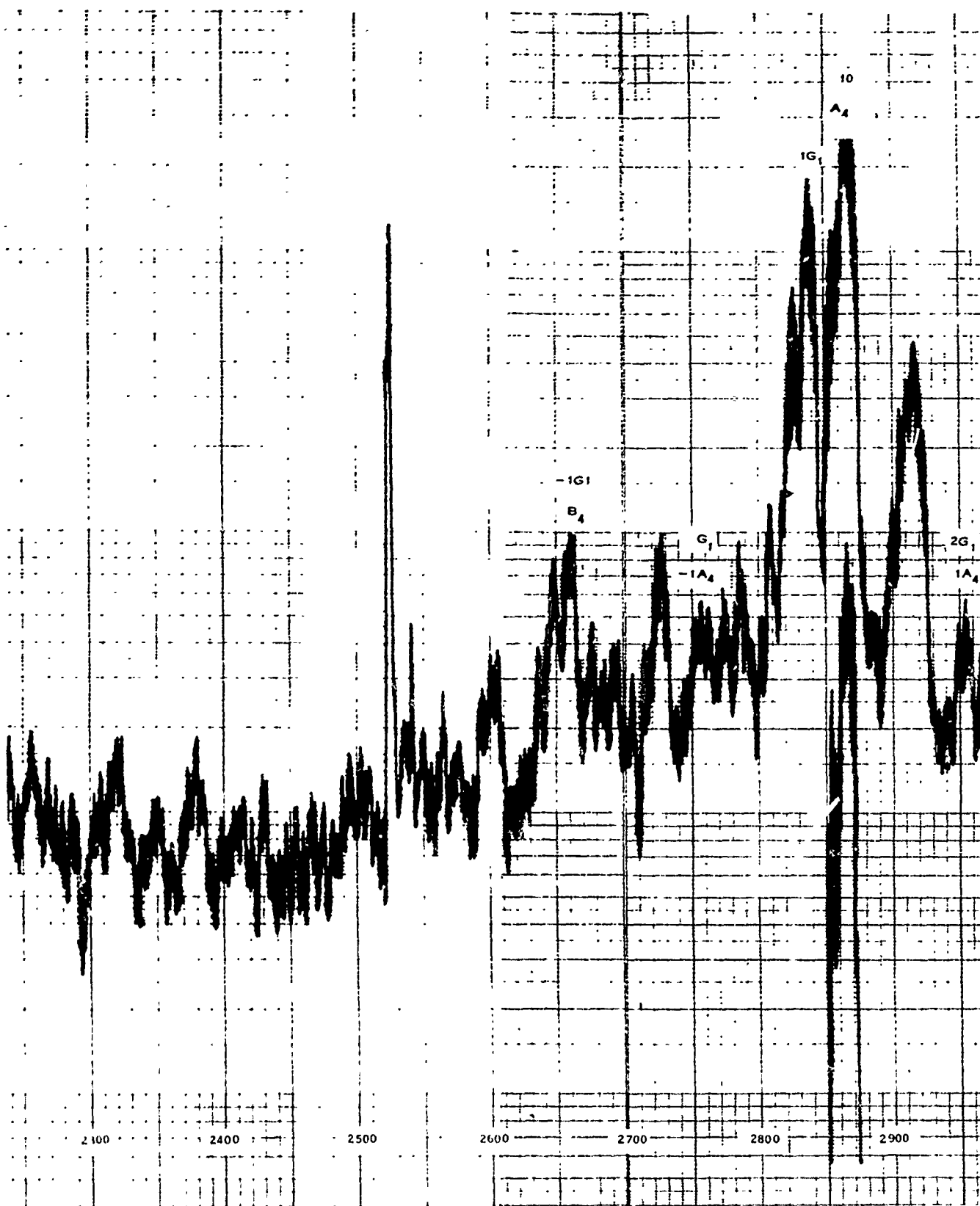


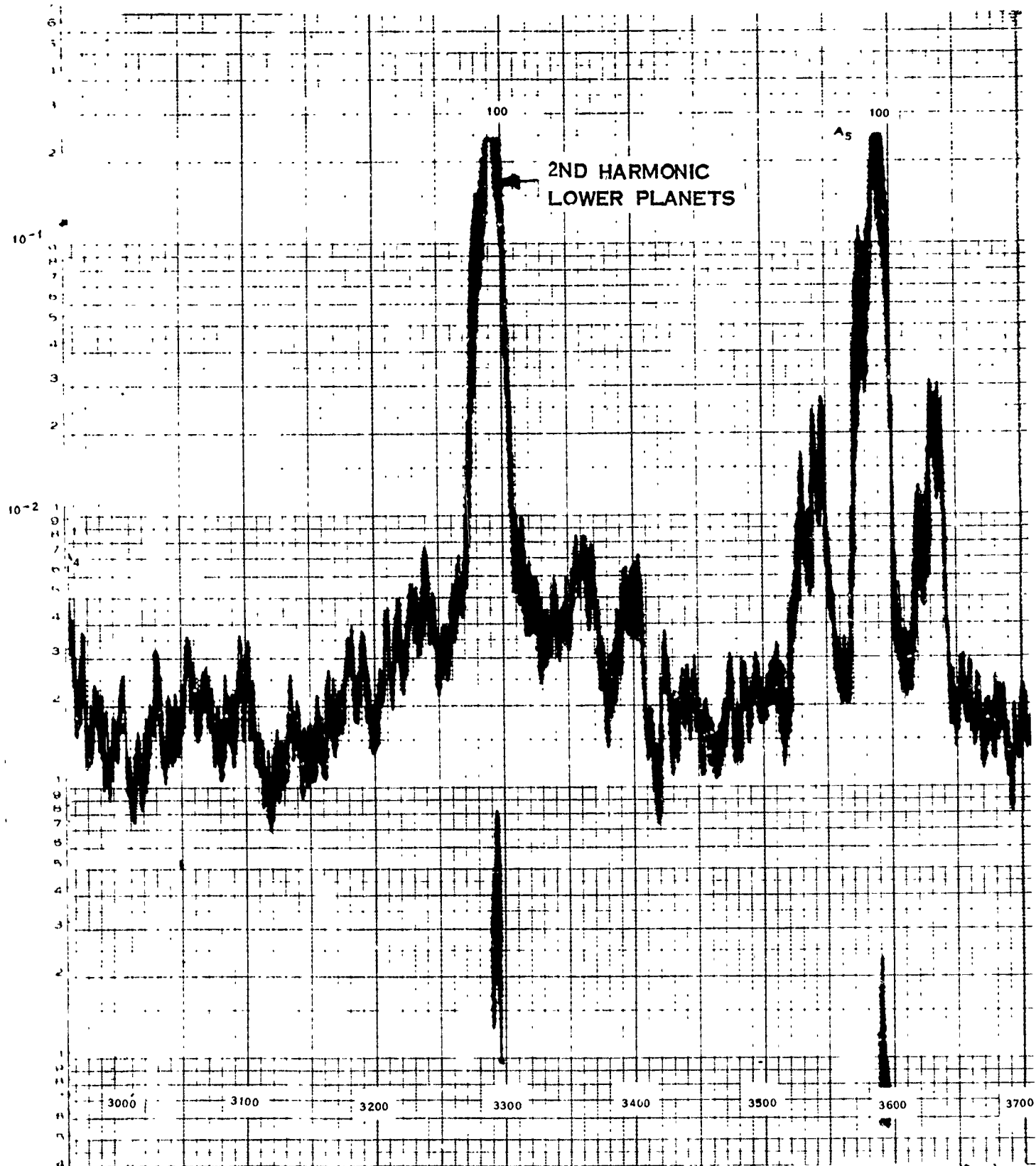




323

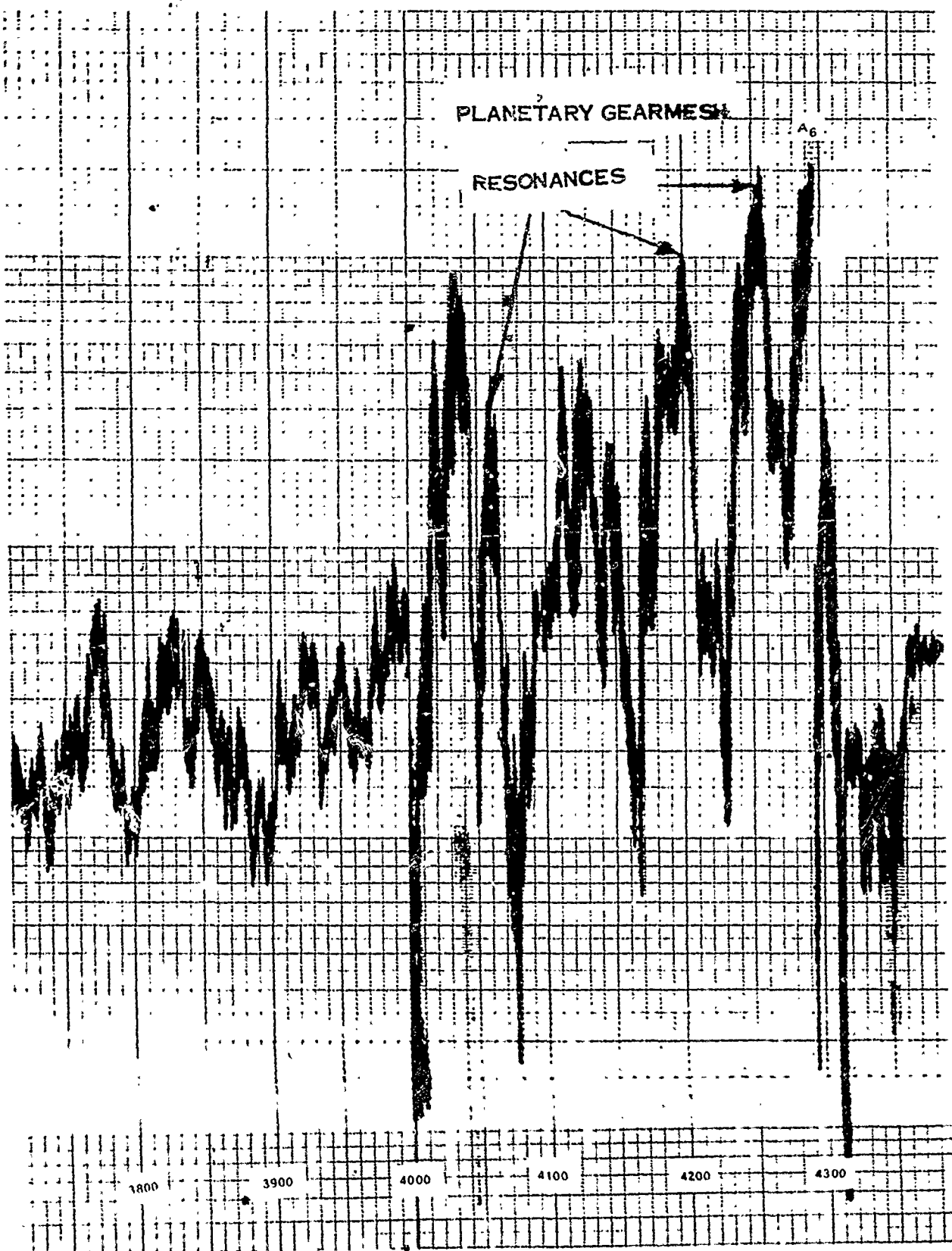
16c





325

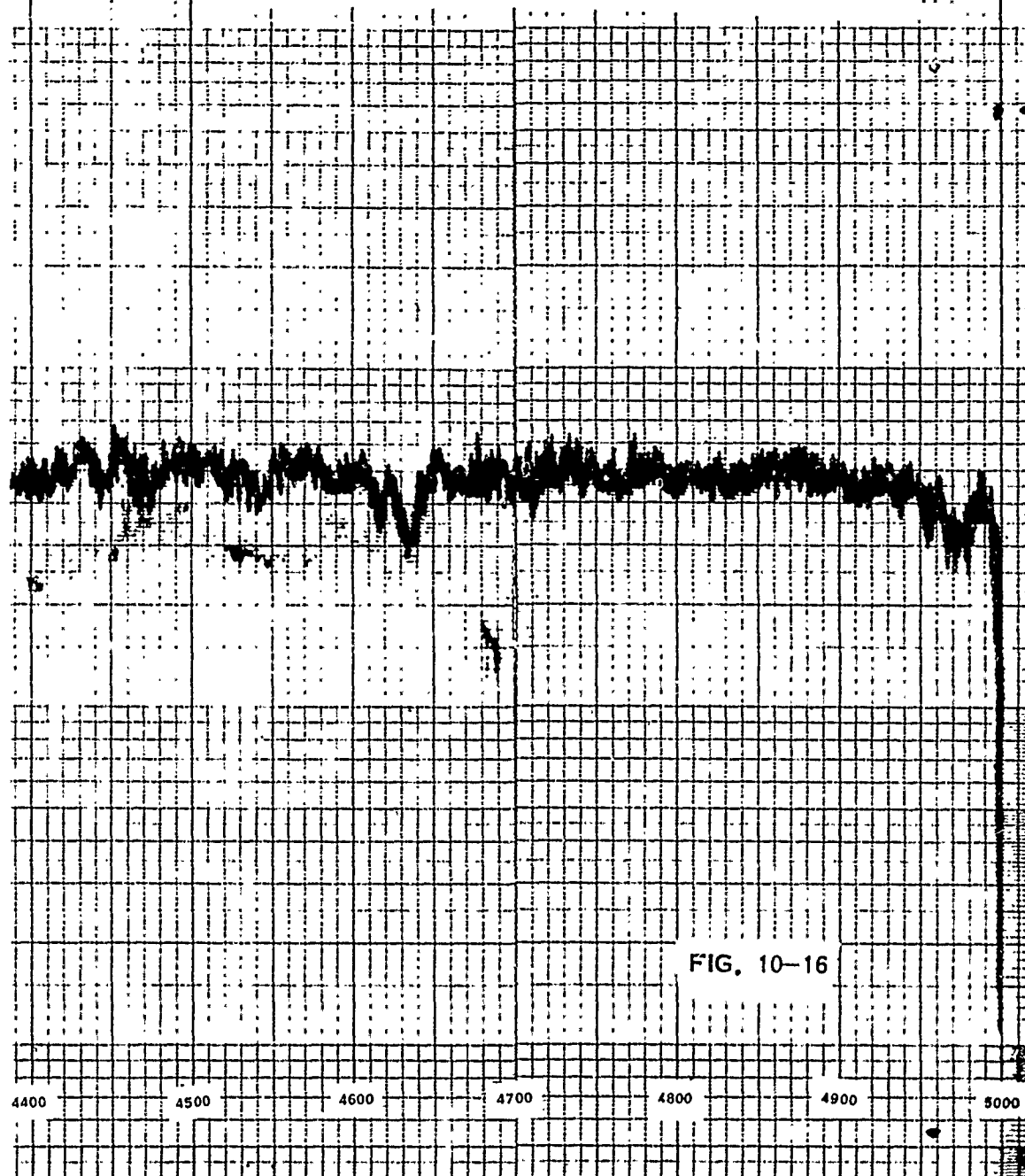
16E



326

**HSEK 6080  
VOLUME II**

TRANSMISSION INPUT QUILL VIBRATION SPECTRUM  
RUN NO. 874 RPM 5720 TORQUE 10,860 IN/LBS.  
ZERO OPERATING HRS. ON BEARING DEFECTIVE  
INPUT QUILL BALL BEARING ASSY. ANALYSIS  
BANDWIDTH 2.5 HZ PARAMETER NO. 125



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FIG 10-16 G

LISTING OF BEARING AND GEAR FREQUENCIES FOR TRANSMISSION INPUT QUILT ASSEMBLY

#	F <sub>1</sub> Hz	Code	2	2F <sub>1</sub> Hz	Code	3F <sub>1</sub> Hz	Code	4F <sub>1</sub> Hz	Code	5F <sub>1</sub> Hz	Code	6F <sub>1</sub> Hz	Code	7F <sub>1</sub> Hz	Code	Input Quill Gearset	Code	Tabulation of Interfering Subbands for F <sub>1</sub>
10	1646	+10A1		2352	+10A2	3058	+10A3	3764	+10A4	4470	+10A5	5176	+10A6			3666	+100H	
9	1552	+9A1		2258	+9A2	2964	+9A3	3670	+9A4	4376	+9A5	5082	+9A6			3772	+90H	
8	1458	+8A1		2164	+8A2	2870	+8A3	3576	+8A4	4282	+8A5	4988	+8A6			3778	+80H	+10A3
7	1364	+7A1		2070	+7A2	2776	+7A3	3482	+7A4	4188	+7A5	4894	+7A6			3784	+70H	+9A3
6	1270	+6A1		1976	+6A2	2682	+6A3	3388	+6A4	4094	+6A5	4800	+6A6			3790	+60H	+8A3
5	1176	+5A1		1882	+5A2	2588	+5A3	3294	+5A4	3900	+5A5	4606	+5A6			3796	+50H	+7A3
4	1082	+4A1		1788	+4A2	2494	+4A3	3200	+4A4	3806	+4A5	4512	+4A6			3802	+40H	+6A3
3	988	+3A1		1694	+3A2	2400	+3A3	3106	+3A4	3712	+3A5	4418	+3A6			3808	+30H	+5A3
2	894	+2A1		1600	+2A2	2306	+2A3	3012	+2A4	3618	+2A5	4324	+2A6			3814	+20H	+4A3
1	800	+1A1		1506	+1A2	2212	+1A3	2918	+1A4	3524	+1A5	4230	+1A6			3820	+10H	+3A3
0	706	A1		1412	A2	2118	A3	2824	A4	3430	A5	4136	A6			3826	GN	+2A3
1	612	-1A1		1318	-1A2	2024	-1A3	2730	-1A4	3336	-1A5	4042	-1A6			3832	-10H	+1A3
2	518	-2A1		1224	-2A2	1930	-2A3	2636	-2A4	3242	-2A5	3948	-2A6			3838	-20H	+0A3
3	424	-3A1		1130	-3A2	1836	-3A3	2542	-3A4	3148	-3A5	3854	-3A6			3844	-30H	+0A3
4	330	-4A1		1036	-4A2	1742	-4A3	2448	-4A4	3054	-4A5	3760	-4A6			3850	-40H	+0A3
5	236	-5A1		942	-5A2	1648	-5A3	2354	-5A4	2960	-5A5	3666	-5A6			3856	-50H	+0A3
6	142	-6A1		848	-6A2	1554	-6A3	2260	-6A4	2876	-6A5	3572	-6A6			3862	-60H	+0A3
7	48	-7A1		754	-7A2	1460	-7A3	2166	-7A4	2782	-7A5	3478	-7A6			3868	-70H	+0A3
8	-	-		660	-8A2	1366	-8A3	2072	-8A4	2688	-8A5	3394	-8A6			3874	-80H	+0A3
9	-	-		576	-9A2	1272	-9A3	1978	-9A4	2594	-9A5	3300	-9A6			3880	-90H	+0A3
10	-	-		482	-10A2	1178	-10A3	1884	-10A4	2490	-10A5	3206	-10A6			3886	-100H	+0A3
10	1600	+10B1		2260	+10B2	2920	+10B3	3580	+10B4	4240	+10B5	4900	+10B6			5560		+10A6
9	1506	+9B1		2166	+9B2	2826	+9B3	3486	+9B4	4146	+9B5	4806	+9B6			5466		+10A6
8	1412	+8B1		2072	+8B2	2732	+8B3	3392	+8B4	4052	+8B5	4712	+8B6			5366		+10A6
7	1318	+7B1		1978	+7B2	2638	+7B3	3298	+7B4	3958	+7B5	4618	+7B6			5266		+10A6
6	1224	+6B1		1884	+6B2	2544	+6B3	3204	+6B4	3864	+6B5	4524	+6B6			5166		+10A6
5	1130	+5B1		1790	+5B2	2450	+5B3	3110	+5B4	3770	+5B5	4430	+5B6			5066		+10A6
4	1036	+4B1		1696	+4B2	2356	+4B3	3016	+4B4	3676	+4B5	4336	+4B6			4966		+10A6
3	942	+3B1		1602	+3B2	2262	+3B3	2922	+3B4	3582	+3B5	4242	+3B6			4866		+10A6
2	848	+2B1		1508	+2B2	2168	+2B3	2828	+2B4	3488	+2B5	4148	+2B6			4766		+10A6
1	754	+1B1		1414	+1B2	2074	+1B3	2734	+1B4	3394	+1B5	4054	+1B6			4666		+10A6
0	660	B1		1320	B2	1980	B3	2640	B4	3300	B5	3960	B6			4566		+10A6
1	566	-1B1		1226	-1B2	1886	-1B3	2546	-1B4	3206	-1B5	3866	-1B6			4466		+10A6
2	472	-2B1		1132	-2B2	1792	-2B3	2452	-2B4	3112	-2B5	3772	-2B6			4366		+10A6
3	378	-3B1		1038	-3B2	1698	-3B3	2358	-3B4	3018	-3B5	3678	-3B6			4266		+10A6
4	284	-4B1		944	-4B2	1604	-4B3	2264	-4B4	2924	-4B5	3584	-4B6			4166		+10A6
5	190	-5B1		850	-5B2	1510	-5B3	2170	-5B4	2830	-5B5	3490	-5B6			4066		+10A6
6	96	-6B1		756	-6B2	1416	-6B3	2076	-6B4	2736	-6B5	3396	-6B6			3966		+10A6
7	2	-7B1		662	-7B2	1322	-7B3	1982	-7B4	2642	-7B5	3302	-7B6			3866		+10A6
8	-	-		568	-8B2	1228	-8B3	1888	-8B4	2548	-8B5	3208	-8B6			3766		+10A6
9	-	-		474	-9B2	1134	-9B3	1794	-9B4	2454	-9B5	3114	-9B6			3666		+10A6
10	-	-		380	-10B2	1040	-10B3	1700	-10B4	2360	-10B5	3020	-10B6			3566		+10A6

TABLE 10.1

PSD UNITS  
 $G^2 \text{ HZ}$

$10^{-1}$

$10^{-2}$

$10^{-3}$

$10^{-4}$

0

$10^{-1}$

B<sub>1</sub>

A<sub>1</sub>

500

329

17 A



10 10 10  
10<sub>2</sub>  
A<sub>2</sub>

-1A<sub>2</sub>

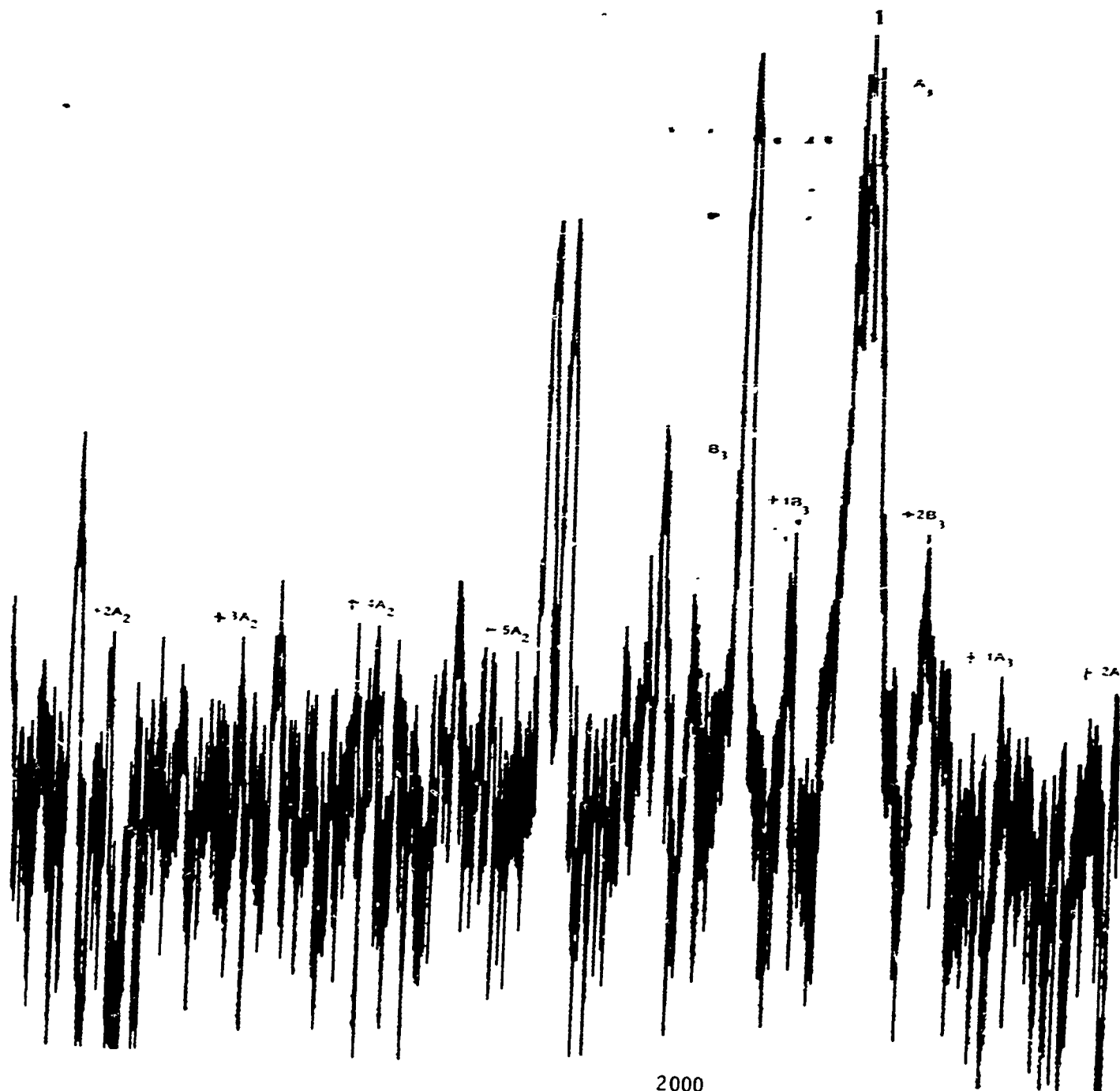
+1A<sub>2</sub>

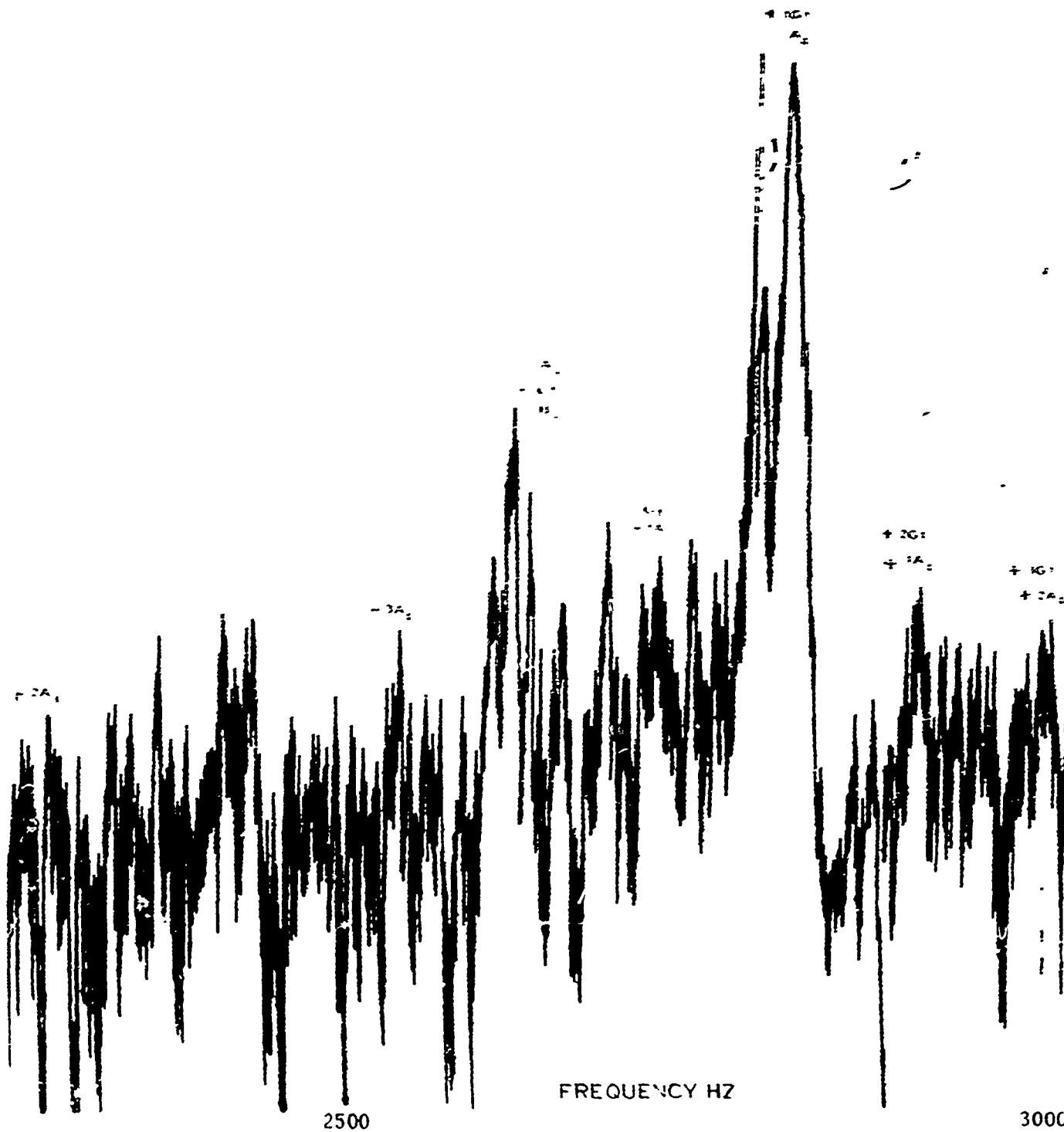
1000

1500

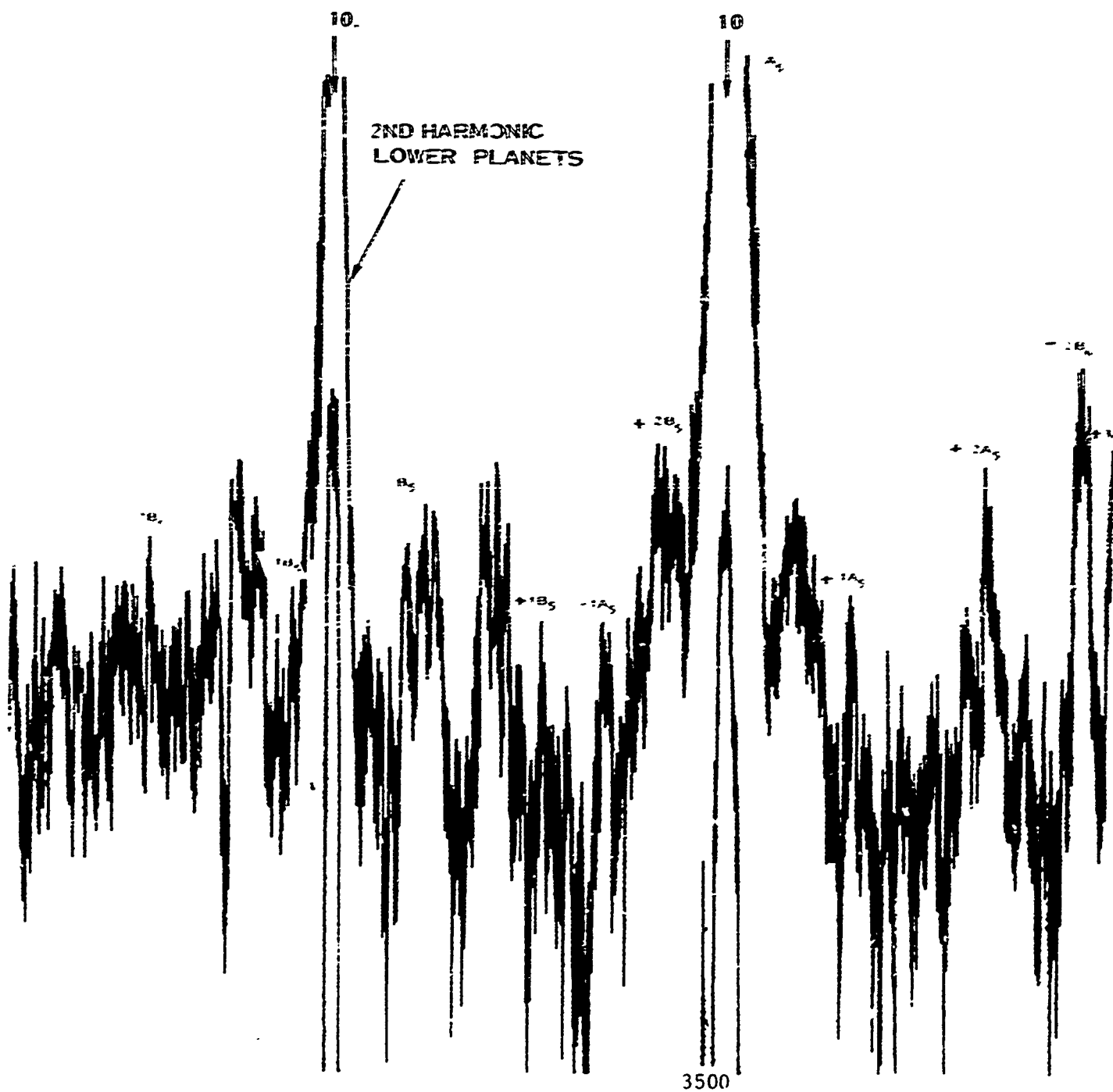
339

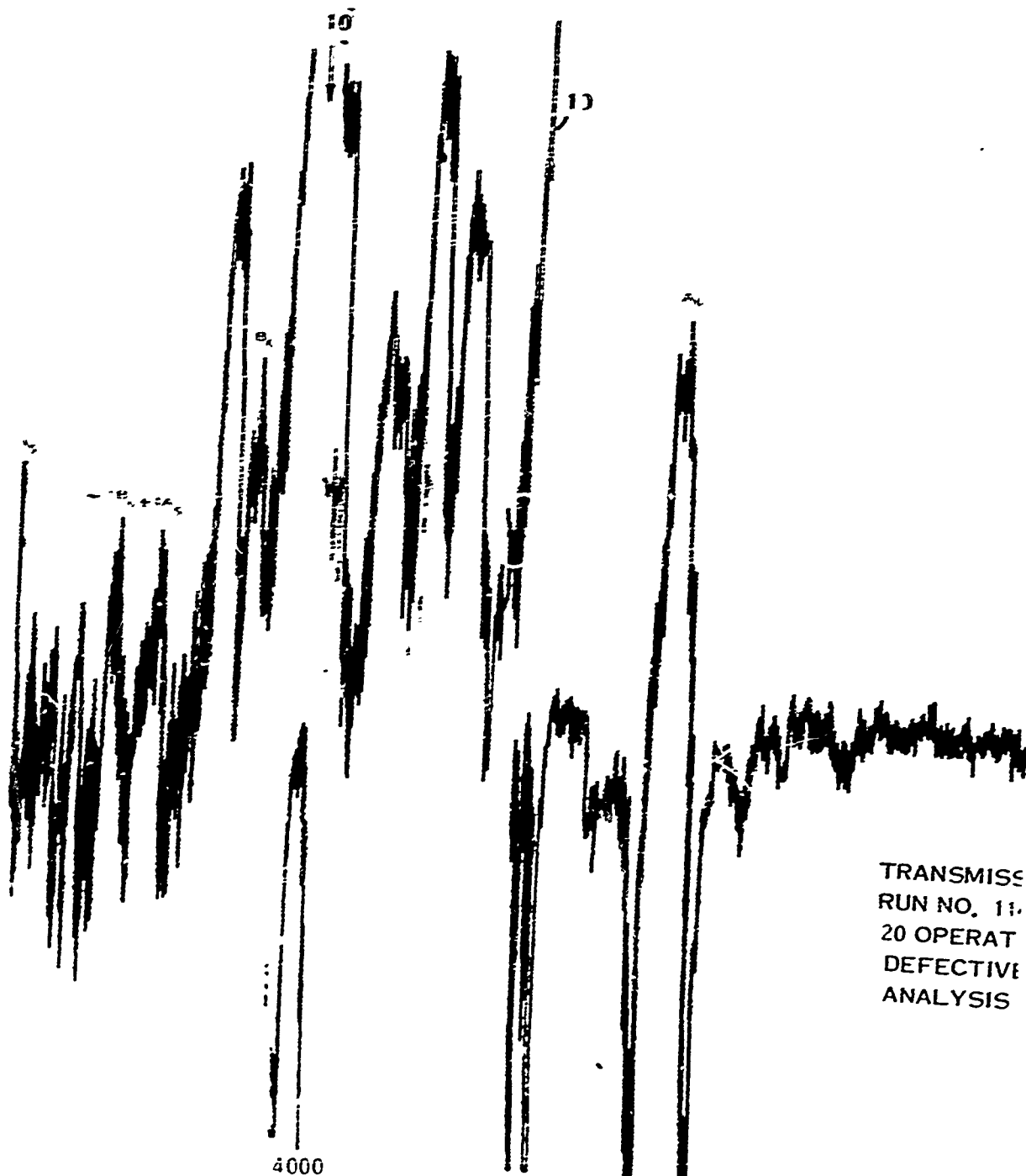
17 B





332





TRANSMISS  
RUN NO. 11  
20 OPERAT  
DEFECTIVE  
ANALYSIS

334

17F

**HSE 6080  
VOLUME II**

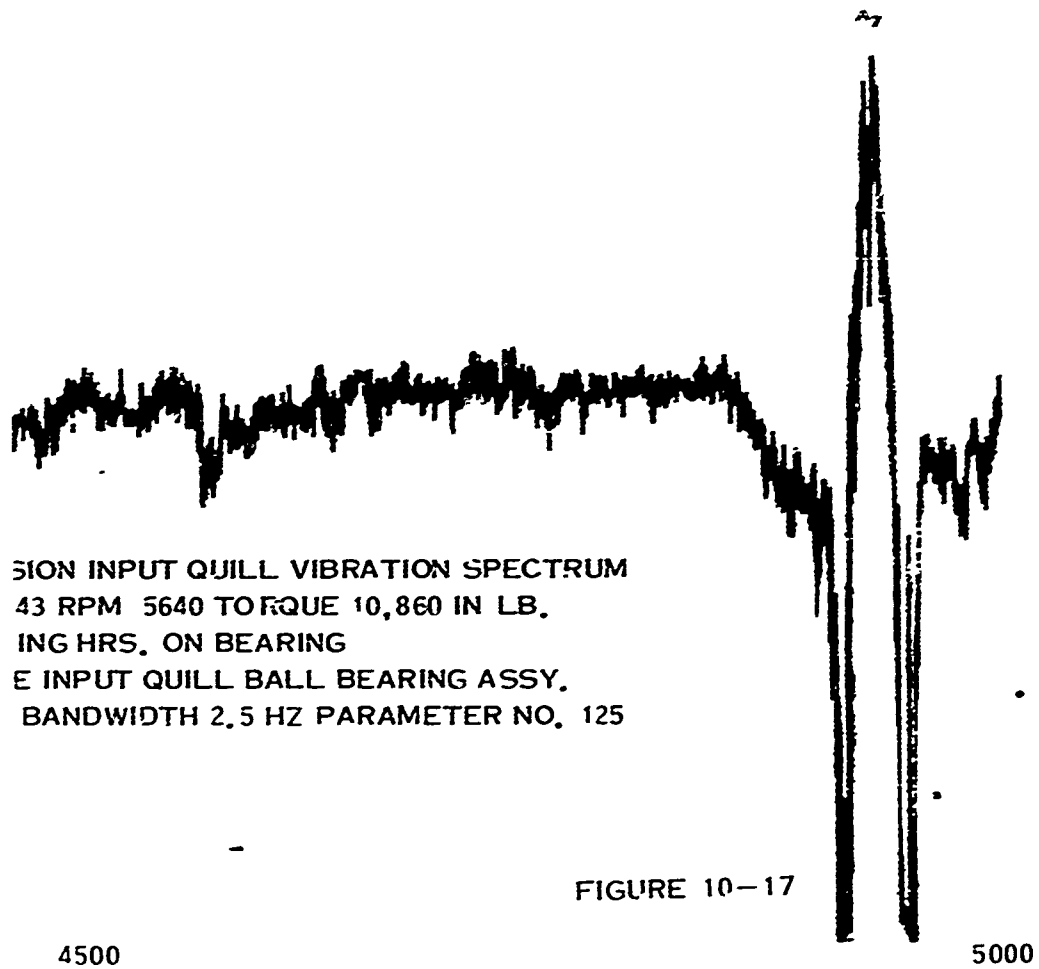


FIGURE 10-17

3:5

FIG 10-17 A

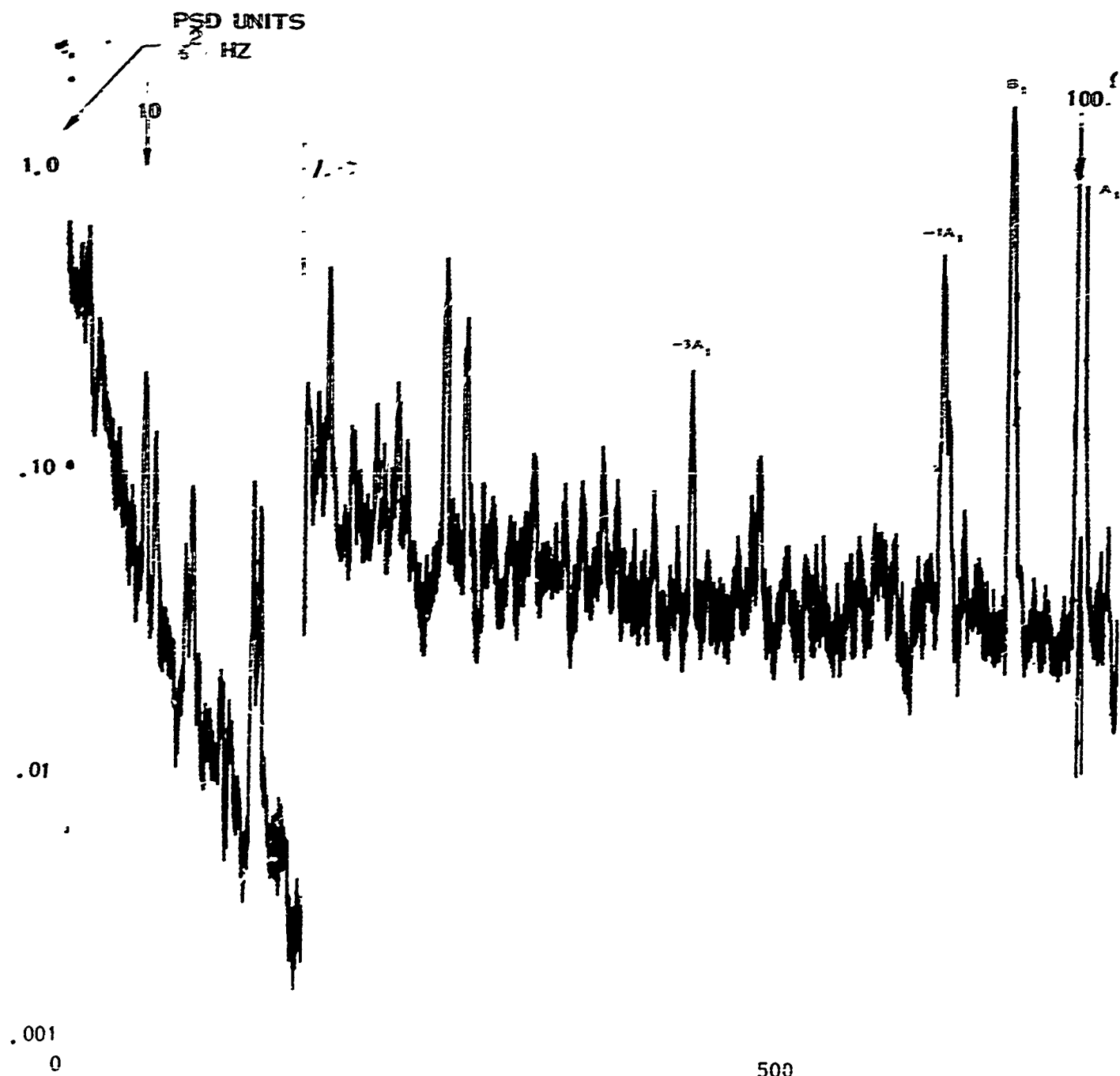
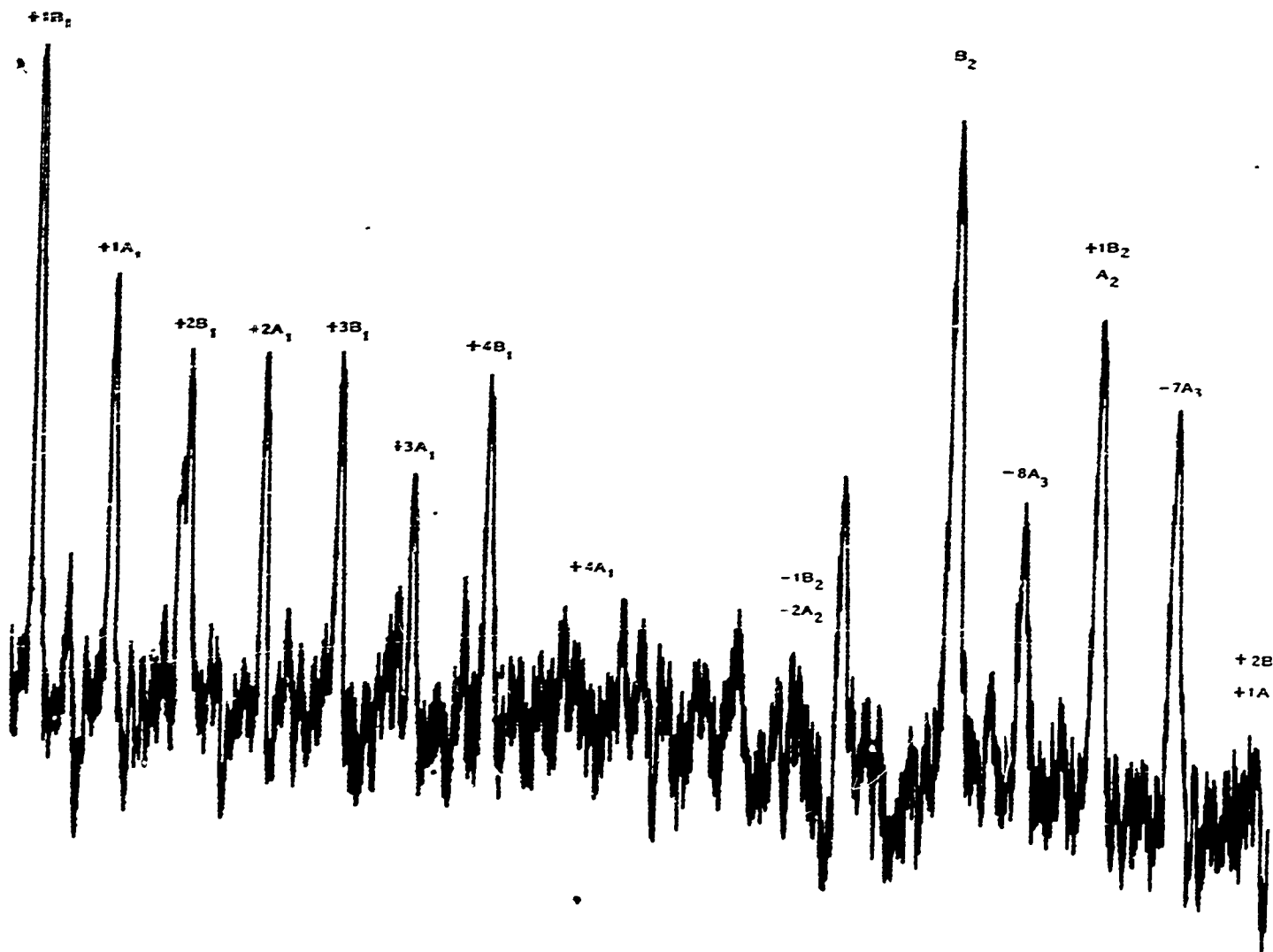


FIG 10-18



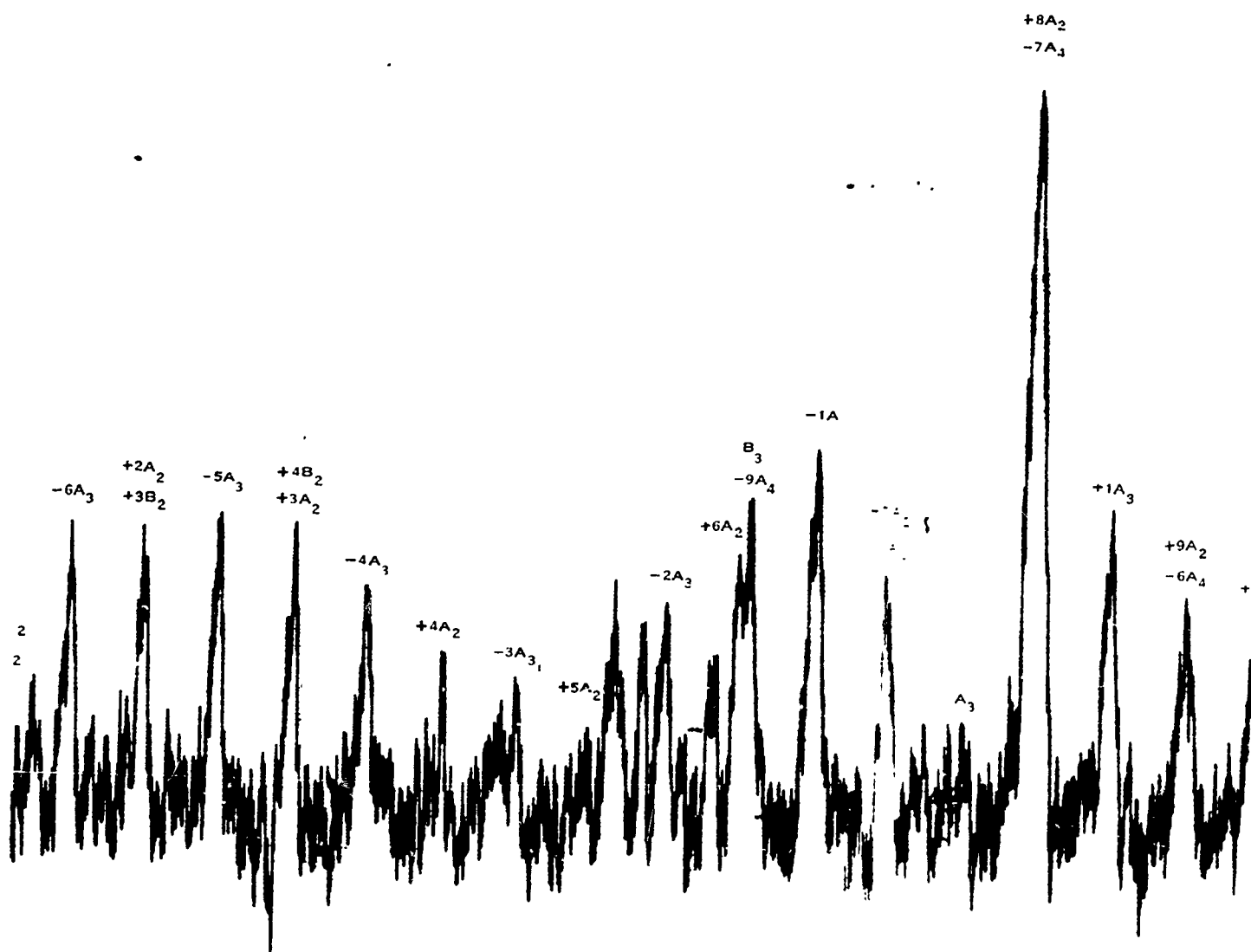
1.441

1500

33

188

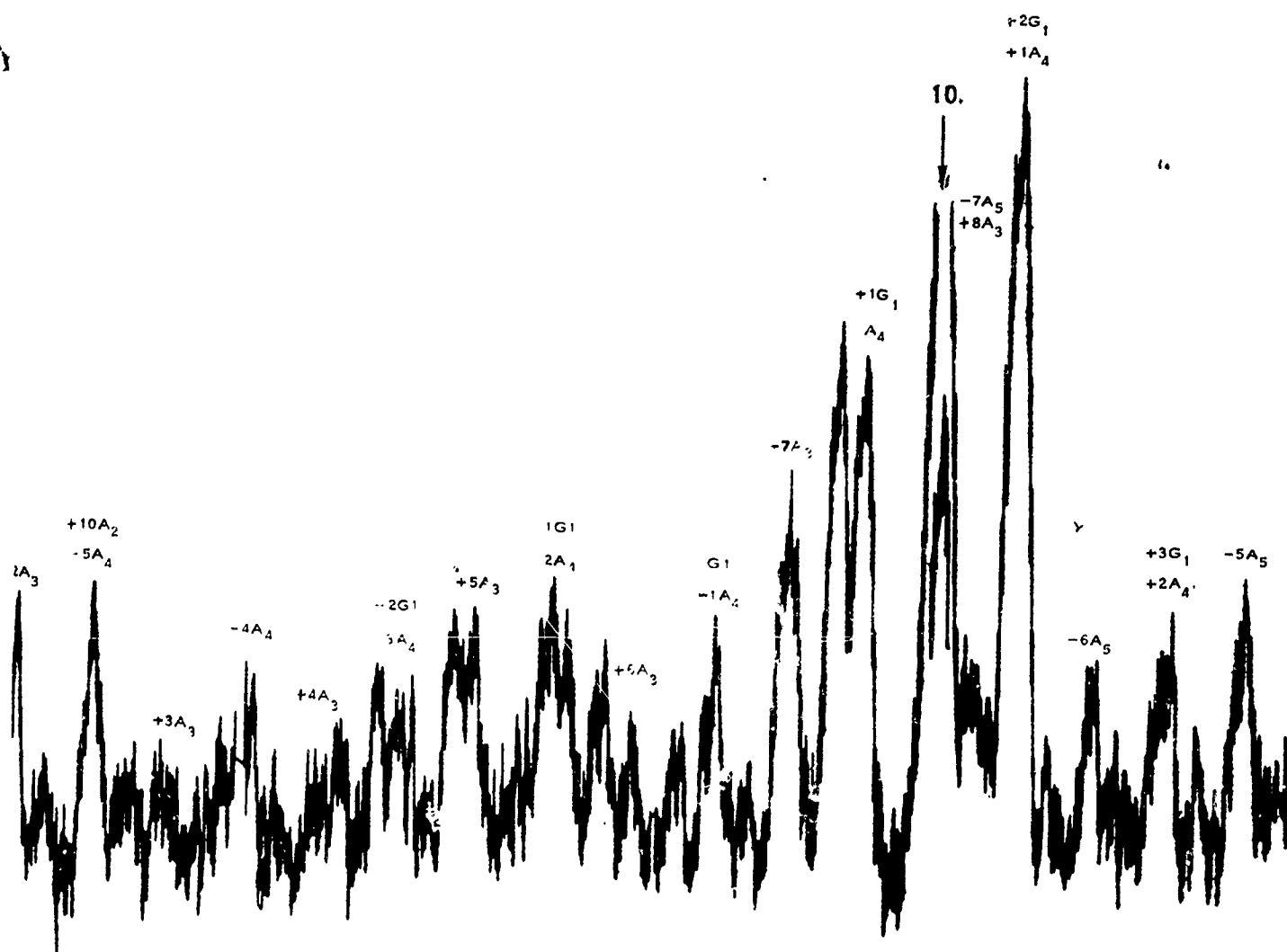




2000

338

18c



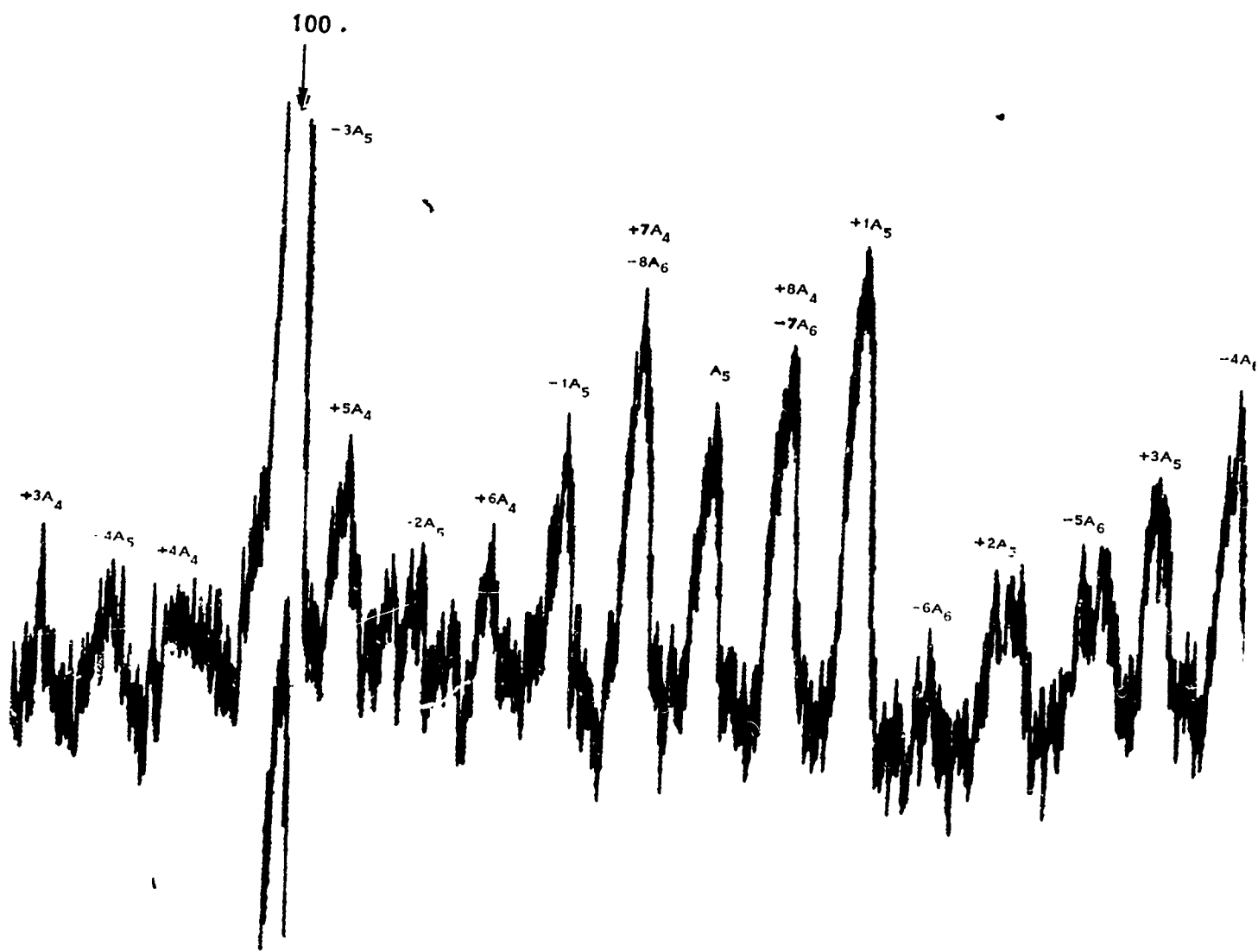
FREQUENCY HZ

2500

3000

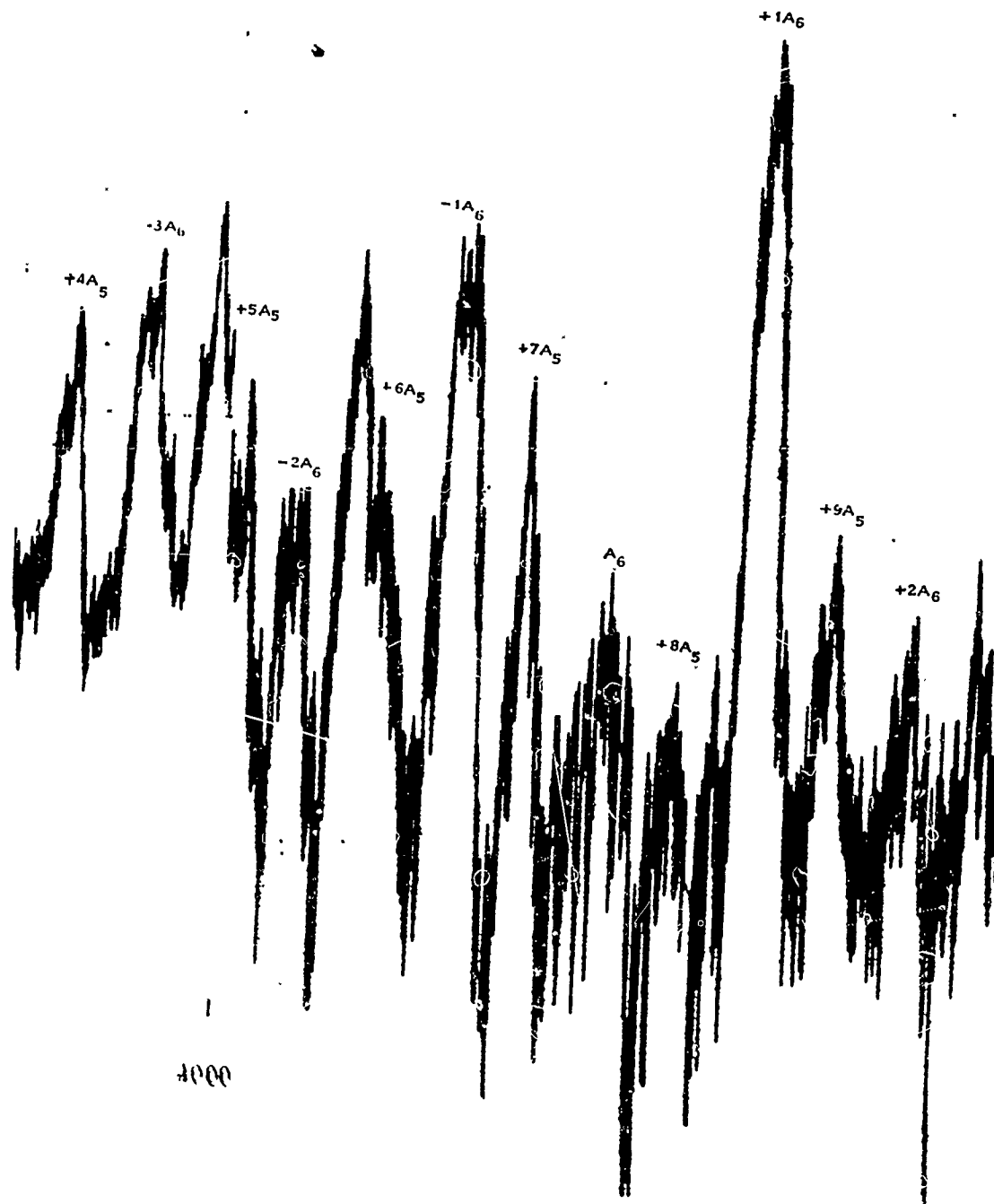
33°

182



3500

3.40

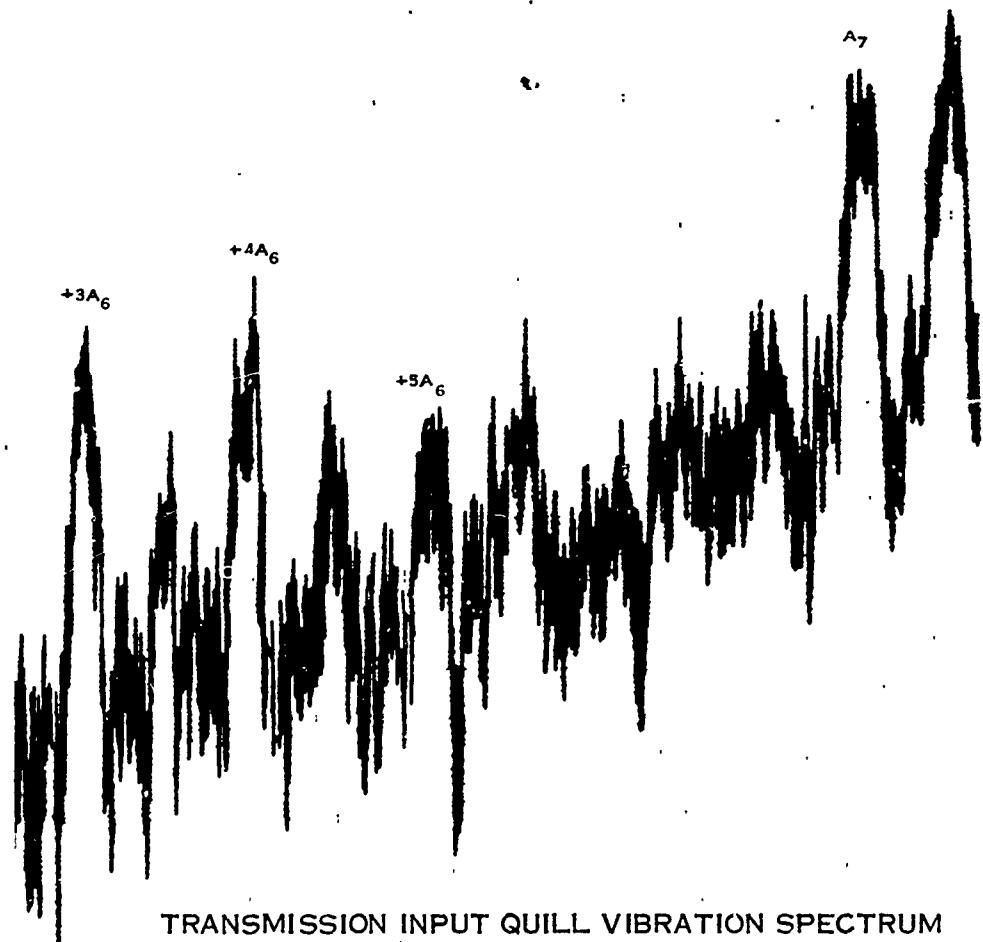


4000

341

18f

**H5ER 6080  
VOLUME II**



TRANSMISSION INPUT QUILL VIBRATION SPECTRUM  
RUN NO. 1360 RPM 5640 TORQUE 10,860 IN-LB.  
40 OPERATING HRS ON BEARING  
DEFECTIVE INPUT QUILL BALL BEARING ASSY.  
ANALYSIS BANDWIDTH 2.5 HZ PARAMETER NO. 125

4500

FIGURE 10-18

5000

342

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